



# STATE MATCH

## New Hampshire Curriculum Frameworks

Reading, Written and Oral  
Communication, Mathematics,  
and Science  
Grades 8–12

and

**ACT**<sup>®</sup>  
EXPLORE<sup>®</sup>, PLAN<sup>®</sup>,  
and the ACT<sup>®</sup>

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# About This Report

## EXECUTIVE SUMMARY

(pp. 1–3)

This portion summarizes the findings of the alignment between New Hampshire's Curriculum Frameworks and ACT's Educational Planning and Assessment System (EPAS™) tests—EXPLORE® (8th, and 9th grades); PLAN® (10th grade); and the ACT® (11th and 12th grades). It also presents ACT's involvement in meeting NCLB requirements and describes additional critical information that ACT could provide to New Hampshire.

## SECTION A

(pp. 5–10)

This section provides tables by content area (Reading, Written and Oral Communication, Mathematics, and Science) listing the precise number of New Hampshire Grade-Level and Grade-Span Expectations measured by ACT's EPAS tests by grade level.

## SECTION B

(pp. 11–50)

All New Hampshire Grade-Level and Grade-Span Expectations are listed here; each one highlighted is measured by ACT's EPAS tests. New Hampshire standards listed here are from the New Hampshire Curriculum Frameworks as presented on the New Hampshire Department of Education's website in January 2007. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests.

## SECTION C

(pp. 51–60)

ACT's College Readiness Standards appear here. Highlighting indicates that a statement reflects one or more statements in the New Hampshire Grade-Level and Grade-Span Expectations. College Readiness Standards not highlighted are not addressed in the New Hampshire Grade-Level and Grade-Span Expectations.

A supplement is available that identifies the specific ACT College Readiness Standard(s) corresponding to each New Hampshire Grade-Level or Grade-Span Expectation in a side-by-side format. To request this supplement, please e-mail ACT at [statematch@act.org](mailto:statematch@act.org).



# Executive Summary

We at ACT believe our programs offer many advantages to New Hampshire students and educators, and this report offers strong evidence for this belief. This alignment analysis clearly answers three critical questions:

1. To what extent do ACT's Educational Planning and Assessment System (EPAS™) tests—EXPLORE® (8th and 9th grades); PLAN® (10th grade); and the ACT® (11th and 12th grades)—measure New Hampshire's Grade-Level and Grade-Span Expectations?
2. Can the results from ACT's testing programs be used to meet New Hampshire's NCLB requirement?
3. Why should New Hampshire choose ACT?

ACT'S TESTS MEASURE  
NEARLY ALL OF NEW  
HAMPSHIRE GRADE  
EXPECTATIONS IN  
READING, WRITTEN  
AND ORAL COMMUNI-  
CATION, MATHEMATICS,  
AND SCIENCE.

**1. Match Results:** Comparisons conducted by our content specialists show that ACT's Reading, English, Writing, Mathematics, and Science tests measure nearly all of New Hampshire's Reading and Written and Oral Communication, Mathematics, and Science Grade-Level and Grade-Span Expectations:

- **Reading:** 8 out of 14 Grade-Level and Grade-Span Expectations Stems  
Many of New Hampshire's Reading Grade-Level and Grade-Span Expectations are covered by ACT's EPAS Reading tests.
- **Written and Oral Communication:** 9 out of 14 Grade-Level and Grade-Span Expectations Stems  
Many of New Hampshire's Written and Oral Communication Grade-Level and Grade-Span Expectations are covered by ACT's EPAS English and/or Writing tests.
- **Mathematics:** 6 out of 6 Grade-Level and Grade-Span Expectations Stems  
Nearly all of New Hampshire's Mathematics Grade-Level and Grade-Span Expectations are covered by ACT's EPAS Mathematics tests.
- **Science:** 4 out of 4 Process Standards Stems  
(13) out of (13) Content Standards Stems  
Nearly all of New Hampshire's Science Grade-Level and Grade-Span Expectations are covered by ACT's EPAS Science tests.

(A note about science content: ACT's Science tests present content from biology, chemistry, physics, and Earth/space sciences. Although content knowledge in these content areas is needed to answer some of the test questions, the test questions emphasize scientific reasoning and are based in experimental science contexts. Factual content knowledge, although needed to answer some of the test questions, is not systematically sampled from the full content knowledge domain. Therefore, each ACT Science Test covers some, but not all, of the discrete science content knowledge specifically described in the New Hampshire Science Grade-Level and Grade-Span Expectations.)

To emphasize the point that content is included, but not necessarily covered in its entirety, on every test form, science content match results appear in parentheses in Section A of this document (which describes the number of New Hampshire standards measured by ACT's tests), and are underlined rather than highlighted in Section B. Our goal here is to clearly communicate that science content will be included, but each specific content topic will not be covered consistently enough for inferences to be made about student proficiency in all areas.)



**STATES CHOOSE ACT BECAUSE:**

- **STUDENT MOTIVATION IS HIGH.**
- **ACT'S IS THE ONLY CURRICULUM-BASED ASSESSMENT SYSTEM THAT MEASURES STUDENT READINESS ALONG A CONTINUUM OF EMPIRICALLY DERIVED COLLEGE READINESS BENCHMARKS.**
- **EPAS DATA PROVIDE HELPFUL FEEDBACK FOR TEACHERS, STUDENTS, AND POLICYMAKERS TO MAKE EDUCATIONAL DECISIONS AND IDENTIFY WAYS TO IMPROVE.**

**ACT BUILDS ITS DEFINITION OF COLLEGE READINESS ON A SOUND EMPIRICAL BASE:**

1. **THE ACT NATIONAL CURRICULUM SURVEY**
2. **ACT'S COLLEGE READINESS BENCHMARK SCORES**
3. **ACT'S COLLEGE READINESS STANDARDS™**

Most exceptions to a match between ACT's tests and New Hampshire's Grade-Level and Grade-Span Expectations arise from standards not being assessable in group settings, standards that are personal in nature, and standards requiring measurement over extended time. If additional testing is deemed necessary, ACT would be interested in working with New Hampshire on developing any necessary augmentation.

**2. NCLB requirement?** Yes; states like Illinois intend to use ACT components as part of testing that will be submitted to the U.S. Department of Education for NCLB approval.

**3. Why choose ACT?** States and school districts choose ACT's EPAS programs because student motivation is high, and EPAS is the *only curriculum-based assessment system that measures student readiness along a continuum of empirically derived college readiness benchmarks*. Various groups claim to describe what students truly need to know and be able to do for college and/or workplace readiness. Such groups typically ask individual experts in education to gather and discuss what they feel is important for students to understand. Not surprisingly, the answers vary. In contrast, ACT defines college readiness through a unique and rigorous empirical process:

- **The knowledge and skills necessary for students to be ready for college-level work are empirically identified via the ACT National Curriculum Survey®.**

ACT surveys thousands of secondary and postsecondary instructors across the nation to determine which skills and knowledge are most important at each course level and for college and work readiness. The responses drive the test specifications for EXPLORE, PLAN, and the ACT.

- **The empirically derived performance levels necessary for students to be ready to succeed in college-level work are defined in ACT's College Readiness Benchmark Scores.**

ACT analyzed thousands of student records to identify the ACT scores associated with success in postsecondary coursework (i.e., a 50% chance of earning a B or better in credit-bearing first-year college courses): 18 for English, 22 for Math, 21 for Reading, and 24 for Science.

- **Skills and knowledge a student currently has and areas for improvement can be identified by the empirically derived ACT College Readiness Standards.**

Using thousands of student records and responses, content and measurement experts worked backwards to develop data-driven, empirically derived statements of what students typically know and are able to do in various score ranges on ACT's English, Reading, Writing, Mathematics, and Science tests. These statements provide specific details about students' college readiness and can be used to identify next steps for improvement.



In sum, ACT's EPAS programs provide abundant data relevant to New Hampshire's Grade-Level and Grade-Span Expectations and to New Hampshire students' readiness for college and work.





## Section A: Number of New Hampshire Curriculum Frameworks Measured by EXPLORE, PLAN, and the ACT

**Table A-1. Number of New Hampshire Reading Grade-Level and Grade-Span Expectations Measured by EXPLORE, PLAN, and the ACT**

	New Hampshire GLE/GSE Stems*	Number of New Hampshire Expectations Measured by ACT's tests	Aspects of Not-Measured New Hampshire Expectations
Reading Fluency and Accuracy:	Reading Fluency and Accuracy	8th: 2 out of 3 10th: 2 out of 3 12th: 2 out of 3	Read with expression and phrasing
Word Identification Skills & Strategies:	Word Identification Skills and Strategies	8th: 0 out of 1 10th: 0 out of 1 12th: 0 out of 1	Identify word by using knowledge of sound
Vocabulary:	Vocabulary Strategies	8th: 1 out of 1 10th: 1 out of 2 12th: 1 out of 2	Use strategies to unlock meaning
	Breadth of Vocabulary	8th: 2 out of 2 10th: 2 out of 2 12th: 2 out of 2	
Literary Texts:	Initial Understanding of Literary Texts	8th: 3 out of 5 10th: 3 out of 5 12th: 3 out of 5	Generate questions before and after reading Identify characteristics of type of literary texts
	Analysis and Interpretation of Literary Texts/ Citing Evidence	8th: 7 out of 7 10th: 6 out of 6 12th: 7 out of 7	
	Generates a Personal Response	8th: 0 out of 2 10th: 0 out of 2 12th: 0 out of 2	Generate personal response to text
Informational Texts:	Initial Understanding of Informational Text	8th: 5 out of 5 10th: 2 out of 5 12th: 2 out of 5	Obtain information from text features (table of contents) Generate questions before, during, after Identify characteristics of variety of types of text
	Analysis and Interpretation of Informational Texts/ Citing Evidence	8th: 5 out of 6 10th: 6 out of 6 12th: 3 out of 5	Evaluate clarity and accuracy of information Critique author's use of strategies
Reading Strategies:	Strategies for Monitoring and Adjusting	8th: 0 out of 1 10th: 0 out of 1 12th: 0 out of 1	Use self-monitoring approaches
	Reading Comprehension Strategies	8th: 1 out of 1 10th: 1 out of 1 12th: 1 out of 1	



**Table A-1. Number of New Hampshire Reading Grade-Level and Grade-Span Expectations Measured by EXPLORE, PLAN, and the ACT**

New Hampshire GLE/GSE Stems*	Number of New Hampshire Expectations Measured by ACT's tests	Aspects of Not-Measured New Hampshire Expectations
Reading Widely and Extensively	8th: 0 out of 3 10th: 0 out of 3 12th: 0 out of 3	Demonstrate habit of reading widely and extensively
Participating in Literate Community	8th: 0 out of 2 10th: 0 out of 2 12th: 0 out of 2	Demonstrate participation in literate community
Reading for Research Across Content Areas	8th: 0 out of 4 10th: 0 out of 4 12th: 0 out of 4	Identify and evaluate sources of information Gather, organize, interpret information Use evidence to support conclusions
<b>Reading Totals</b>  8 out of 14 GLE/GSE Stems	8th: 26 out of 43 10th: 23 out of 43 12th: 21 out of 43	

Breadth of Reading

\*Refer to New Hampshire's Reading Grade-Level and Grade-Span Expectations on pages 11–19





**Table A-2. Number of New Hampshire Written and Oral Communication Grade-Level and Grade-Span Expectations Measured by EXPLORE, PLAN, and the ACT**

	<b>New Hampshire GLE/GSE Stems*</b>	<b>Number of New Hampshire Expectations Measured by ACT's tests</b>	<b>Aspects of Not-Measured New Hampshire Expectations</b>
Habit of Writing	Uses a Writing Process	8th: 1 out of 1 10th: 1 out of 1 12th: 1 out of 1	
	Writing Extensively	8th: 0 out of 4 10th: 0 out of 4 12th: 0 out of 4	Demonstrate habit of writing extensively
Structures of Language	Applying Understanding of Sentences, Paragraphs, Text Structures	8th: 2 out of 5 10th: 2 out of 5 12th: 3 out of 5	Use paragraph form: indenting Apply directionality to text
Writing in Response to Literary or Informational Text	Showing Understanding of Ideas in Text	8th: 0 out of 2 10th: 0 out of 2 12th: 0 out of 3	Informational or literary text
	Making Analytical Judgments about Text	8th: 0 out of 4 10th: 0 out of 4 12th: 2 out of 4	Make inferences about relationships Use specific references to text to support
Expressive Writing	Narrative—Creating a Story Line	8th: 4 out of 5 10th: 4 out of 6 12th: 4 out of 6	Establish context character motivation Use literary devices
	Narrative—Applying Narrative Strategies	8th: 3 out of 7 10th: 3 out of 7 12th: 3 out of 7	Use dialogue to advance plot Develop characters Control the pace of the story Use voice appropriate to purpose
	Poetry	8th: 0 out of 7 10th: 0 out of 7 12th: 0 out of 7	Write poetry
	Reflective Essay	8th: 3 out of 4 10th: 4 out of 5 12th: 5 out of 6	Analyze condition of significance or concrete occasion as basis for the reflection
Informational Writing	Reports, Procedures, or Persuasive Writing—Organizing and Conveying Information	8th: 3 out of 6 10th: 4 out of 7 12th: 5 out of 7	Establish topic Authoritative voice
	Using Elaboration Strategies	8th: 1 out of 4 10th: 1 out of 4 12th: 4 out of 4	
Writing Conventions	Applying Rules of Grammar, Usage, and Mechanics	8th: 2 out of 4 10th: 2 out of 4 12th: 4 out of 4	Apply word-derivative spelling patterns



**Table A-2. Number of New Hampshire Written and Oral Communication Grade-Level and Grade-Span Expectations Measured by EXPLORE, PLAN, and the ACT**

New Hampshire GLE/GSE Stems*	Number of New Hampshire Expectations Measured by ACT's tests	Aspects of Not-Measured New Hampshire Expectations
Interactive Listening Draft for Public Review and Feedback	8th: 0 out of 5 10th: 0 out of 5 12th: 0 out of 5	Oral communication
Making Presentations Draft for Public Review and Feedback	8th: 0 out of 6 10th: 0 out of 6 12th: 0 out of 6	Make oral presentation
<b>Written and Oral Communication Totals</b>  9 out of 14 GLE/GSE Stems	8th: 19 out of 64 10th: 21 out of 67 12th: 31 out of 69	

Oral Communication Strategies

\*Refer to New Hampshire's Written and Oral Communication Grade-Level and Grade-Span Expectations on pages 20–28



**Table A-3. Number of New Hampshire Mathematics Grade-Level and Grade-Span Expectations Measured by EXPLORE, PLAN, and the ACT**

New Hampshire GLE/GSE Stems*	Number of New Hampshire Expectations Measured by ACT's tests	Aspects of Not-Measured New Hampshire Expectations
Number and Operations	8th: 6 out of 6 HS: 5 out of 5 AM: 3 out of 3	
Geometry and Measurement	8th: 4 out of 4 HS: 7 out of 7 AM: 4 out of 4	
Functions and Algebra	8th: 4 out of 4 HS: 4 out of 4 AM: 4 out of 4	
Data, Statistics, and Probability	8th: 6 out of 6 HS: 6 out of 6 AM: 3 out of 4	Use technology to explore linear regression
Problem Solving, Reasoning, and Proof	8th: 2 out of 2 HS: 1 out of 2	Use technology to solve real-world problems (e.g., personal finance, banking, taxes)
Communication, Connections, and Representations	8th: 3 out of 3 HS: 3 out of 3	
<b>TOTALS</b> 6 out of 6 GLE/GSE Stems	8th: 25 out of 25 HS: 26 out of 27 AM: 14 out of 15	

\*Refer to New Hampshire's Mathematics Grade-Level and Grade-Span Expectations on pages 29–37



**Table A-4. Number of New Hampshire Science Grade-Level and Grade-Span Expectations Measured by EXPLORE, PLAN, and the ACT**

	<b>New Hampshire GLE/GSE Stems*</b>	<b>Number of New Hampshire Expectations Measured by ACT's tests</b>	<b>Aspects of Not-Measured New Hampshire Expectations</b>
Earth Space Science	ESS1	9-11: (7) out of (7) 11-12: (2) out of (2)	
	ESS2	9-11: (3) out of (3) 11-12: (1) out of (1)	
	ESS3	9-11: (3) out of (3)	
	ESS4	9-11: (4) out of (4) 11-12: (2) out of (3)	
Life Science	LS1	9-11: (3) out of (3) 11-12: (3) out of (3)	
	LS2	9-11: (2) out of (2)	
	LS3	9-11: (3) out of (3) 11-12: (1) out of (1)	
	LS4	9-11: (3) out of (3)	
	LS5	9-11: (2) out of (4) 11-12: (1) out of (3)	
Physical Science	PS1	9-11: (2) out of (2) 11-12: (1) out of (1)	
	PS2	9-11: (3) out of (3) 11-12: (2) out of (2)	
	PS3	9-11: (2) out of (2) 11-12: (2) out of (2)	
	PS4	9-11: (3) out of (4) 11-12: (2) out of (4)	
	<b>TOTALS</b> 13 out of 13 GLE/GSE Stems	9-11: (40) out of (43) 11-12: (17) out of (22)	<b>Content Standards</b>
Process Skills	SPS1	11th: 5 out of 5	
	SPS2	11th: 3 out of 5	Systems and energy Models and scale
	SPS3	11th: 2 out of 3	Collaborate with existing research efforts
	<b>TOTALS</b> 3 out of 3 GLE/GSE Stems	11th: 10 out of 13	<b>Process Standards</b>

\*Refer to New Hampshire's Science Grade-Level and Grade-Span Expectations on pages 38–50



# Section B: New Hampshire's Grades 8–12 Curriculum Frameworks Measured by EXPLORE, PLAN, and the ACT

## Reading

### NEW HAMPSHIRE Grade 8 Reading Curriculum Frameworks

#### READING FLUENCY AND ACCURACY

**R-8-11.** Reads grade-level appropriate material with:

- **R-8-11.1.** Accuracy: reading material appropriate for grade 8 with at least 90–94% accuracy (Local)
- **R-8-11.2.** Fluency: reading with appropriate silent and oral reading fluency rates as determined by text demands, and purpose for reading (Local)
- **R-8-11.3.** Fluency: reading familiar text with phrasing and expression, and with attention to text features such as punctuation, italics, and dialogue (Local)

#### WORD IDENTIFICATION SKILLS AND STRATEGIES

**R-8-1.** Applies word identification/decoding strategies by...

- **R-8-1.1.** Identifying multi-syllabic words by using knowledge of sounds, syllable division, and word patterns (Local)

#### VOCABULARY STRATEGIES AND BREADTH OF VOCABULARY

**R-8-2.** Students identify the meaning of unfamiliar vocabulary by...

- **R-8-2.1.** Using strategies to unlock meaning (e.g., knowledge of word structure, including prefixes/suffixes, base words, common roots, or word origins; or context clues; or other resources, such as dictionaries, glossaries, thesauruses; or prior knowledge) (Local)

**R-8-3.** Shows breadth of vocabulary knowledge through demonstrating understanding of word meanings and relationships by...

- **R-8-3.1.** Identifying synonyms, antonyms, homonyms/homophones, shades of meaning, or word origins, including words from other languages that have been adopted into our language (Local)
- **R-8-3.2.** Selecting appropriate words or explaining the use of words in context, including content specific vocabulary, words with multiple meanings, or precise vocabulary (Local)

#### INITIAL UNDERSTANDING of LITERARY TEXTS

**R-8-4.** Demonstrate initial understanding of elements of literary texts by...

- **R-8-4.1.** Identifying or describing character(s), setting, problem/solution, or plots/subplots, as appropriate to text; or identifying any significant changes in character or setting over time; or identifying rising action, climax, or falling action (Local)

- **R-8-4.2.** Paraphrasing or summarizing key ideas/plot, with major events sequenced, as appropriate to text (Local)
- **R-8-4.3.** Generating questions before, during, and after reading to enhance/expand understanding and/or gaining new information (Local)
- **R-8-4.4.** Identifying the characteristics of a variety of types/genres of literary text (e.g., literary texts: poetry, plays, fairytales, fantasy, fables, realistic fiction, folktales, historical fiction, mysteries, science fiction, myths, legends, short stories, epics (poems, novels, dramas) (Local)
- **R-8-4.5.** Identifying literary devices as appropriate to genre: rhyme schemes, alliteration, simile, dialogue, imagery, metaphors, flashback, onomatopoeia, repetition, personification, or hyperbole (Local)

#### ANALYSIS AND INTERPRETATION OF LITERARY TEXTS/CITING EVIDENCE

**R-8-5.** Analyze and interpret elements of literary texts, citing evidence where appropriate by...

- **R-8-5.1.** Explaining or supporting logical predictions (Local)
- **R-8-5.2.** Describing characterization (e.g., stereotype, antagonist, protagonist), motivation, or interactions, citing thoughts, words, or actions that reveal characters' traits, motivations, or their changes over time (Local)
- **R-8-5.3.** Making inferences about cause/effect, internal or external conflicts (e.g., person versus self, person versus person, person versus nature/society/fate), or the relationship among elements within text (e.g., describing the interaction among plot/subplots) (Local)
- **R-8-5.4.** Explaining how the narrator's point of view affects the reader's interpretation (Local)
- **R-8-5.5.** Explaining how the author's message or theme (which may include universal themes) is supported within the text (Local)

**R-8-6.** Analyze and interpret author's craft, citing evidence where appropriate by...

- **R-8-6.1.** Demonstrating knowledge of author's style or use of literary elements and devices (e.g., imagery, repetition, flashback, foreshadowing, personification, hyperbole, symbolism, or use of punctuation) to analyze literary works (Local)
- **R-8-6.2.** [becomes subsumed under R-8-6.1, since all aspects are assessed Locally in grade 8]

**R-8-16.** Generates a personal response to what is read through a variety of means...

- **R-8-16.1.** Comparing stories or other texts to related personal experience, prior knowledge, or to other books (Local)
- **R-8-16.2.** Providing relevant details to support the connections made or judgments (interpretive, analytical, evaluative, or reflective) (Local)

## INITIAL UNDERSTANDING OF INFORMATIONAL TEXT

**R-8-7.** Demonstrate initial understanding of informational texts (expository and practical texts) by...

- **R-8-7.1.** Obtaining information from text features (e.g., table of contents, glossary, index, transition words/phrases, transitional devices, bold or italicized text, headings, subheadings, graphic organizers, charts, graphs, or illustrations) (Local)
- **R-8-7.2.** Using information from the text to answer questions, to state the main/central ideas, or to provide supporting details (Local)
- **R-8-7.3.** Organizing information to show understanding or relationships among facts, ideas, and events (e.g., representing main/central ideas or details within text through charting, mapping, paraphrasing, summarizing, comparing/contrasting, or outlining) (Local)
- **R-8-7.4.** Generating questions before, during, and after reading to enhance understanding and recall; expand understanding and/or gain new information (Local)
- **R-8-7.5.** Identifying the characteristics of a variety of types of text (e.g., reference: reports, magazines, newspapers, textbooks, biographies, autobiographies, Internet websites, public documents and discourse, essays, articles, technical manuals ; and practical/functional: procedures/instructions, announcements, invitations, book orders, recipes, menus, advertisements, pamphlets, schedules) (Local)

## ANALYSIS AND INTERPRETATION OF INFORMATIONAL TEXTS/CITING EVIDENCE

**R-8-8.** Analyze and interpret informational text, citing evidence as appropriate by...

- **R-8-8.1.** Explaining connections about information within a text, across texts, or to related ideas (Local)
- **R-8-8.2.** Synthesizing and evaluating information within or across text(s) (e.g., constructing appropriate titles; or formulating assertions or controlling ideas) (Local)
- **R-8-8.3.** Drawing inferences about text, including author's purpose (e.g., to inform, explain, entertain, persuade) or message; or explaining how purpose may affect the interpretation of the text; or using supporting evidence to form or evaluate opinions/judgments and assertions about central ideas that are relevant (Local)
- **R-8-8.4.** Distinguishing fact from opinion, and identifying possible bias/propaganda or conflicting information within or across texts (Local)
- **R-8-8.5.** Making inferences about causes or effects (Local)

- **R-8-8.6.** Evaluating the clarity and accuracy of information (Local)

## READING STRATEGIES: Strategies for Monitoring and Adjusting

**R-8-12.** Demonstrates ability to monitor comprehension for different types of text and purposes by...

- **R-8-12.1.** Using a range of self-monitoring and self-correction approaches (e.g., predicting and confirming, rereading, adjusting rate, sub-vocalizing, consulting resources, questioning, skimming, scanning, using syntax/language structure, semantics/meaning, or other context cues, etc.) (Local)

## READING STRATEGIES: Reading Comprehension Strategies

**R-8-13.** Uses comprehension strategies (flexibly and as needed) before, during, and after reading literary and informational text (Local)

## BREADTH OF READING: Reading Widely and Extensively

**R-8-14.** Demonstrates the habit of reading widely and extensively\* by...

- **R-8-14.1.** Reading with frequency, including in-school, out-of-school, and summer reading (Local)
- **R-8-14.2.** Reading from a wide range of genres/kinds of text, including primary and secondary sources, and a variety of authors (e.g., literary, informational, and practical/functional texts) (Local)
- **R-8-14.3.** Reading multiple texts for depth of understanding an author, a subject, a theme, or genre (Local)

\*Materials should be at the student's instructional and independent reading levels. The specific number of books should be viewed flexibly and is less important than the extensiveness, duration/ time and frequency of reading.

**R-8-17.** Demonstrates participation in a literate community by...

- **R-8-17.1.** Self-selecting reading materials in line with reading ability and personal interests (Local)
- **R-8-17.2.** Participating in in-depth discussions about text, ideas, and student writing by offering comments and supporting evidence, recommending books and other materials, and responding to the comments and recommendations of peers, librarians, teachers, and others (Local)

## BREADTH OF READING: Reading for Research Across Content Areas

**R-8-15.** Research\*\* by reading multiple sources (including print and non-print texts) to solve a problem, or to make a decision, or to formulate a judgment, or to support a thesis by...

- **R-8-15.1.** Identifying and evaluating potential sources of information (Local)
- **R-8-15.2.** Evaluating information presented, in terms of completeness and relevance (Local)

- **R-8-15.3.** Gathering, organizing, analyzing, and interpreting the information (Local)
- **R-8-15.4.** Using evidence to support conclusions (Local)

\*\*Research materials should be at the student's instructional and independent reading levels, including print and non-print texts.

# NEW HAMPSHIRE Grade 10 Reading Curriculum Frameworks

## READING FLUENCY AND ACCURACY

### R-10-11. Reads grade-level appropriate material with:

- **R-10-11.1. Accuracy:** reading material appropriate for high school with at least 90–94% accuracy (Local)
- **R-10-11.2. Fluency:** reading with appropriate silent and oral reading fluency rates as determined by text demands, and purpose for reading (Local)
- **R-10-11.3. Fluency:** reading familiar text with phrasing and expression, and with attention to text features such as punctuation, italics, and dialogue (Local)

## WORD IDENTIFICATION SKILLS AND STRATEGIES

### R-10-1. Applies word identification/decoding strategies by...

- **R-10-1.1.** Identifying multi-syllabic words by using knowledge of sounds, syllable division, and word patterns (Local)

## VOCABULARY STRATEGIES AND BREADTH OF VOCABULARY

### R-10-2. Students identify the meaning of unfamiliar vocabulary by...

- **R-10-2.1a.** Using strategies to unlock meaning (e.g., knowledge of word structure) including prefixes/suffixes, common roots, or word origins; or context clues; or resources including dictionaries, glossaries, or thesauruses to determine definition, pronunciation, etymology, or usage of words; or prior knowledge (State)
- **R-10-2.1b.** Using strategies to unlock meaning including base words, general and specialized print or electronic resources to determine definition, pronunciation, etymology, or usage of words; or prior knowledge (Local)

### R-10-3. Shows breadth of vocabulary knowledge through demonstrating understanding of word meanings and relationships by...

- **R-10-3.1.** Identifying synonyms, antonyms, homonyms/homophones, shades of meaning, analogies, idioms, or word origins, including words from dialects, or other languages that have been adopted into our language/standard English (State)
- **R-10-3.2.** Selecting appropriate words or explaining the use of words in context, including connotation or denotation, shades of meanings of words/nuances, or idioms; or use of content-specific vocabulary, words with multiple meanings, precise language, or technical vocabulary (State)

## INITIAL UNDERSTANDING OF LITERARY TEXTS

### R-10-4. Demonstrate initial understanding of elements of literary texts by...

- **R-10-4.1.** Identifying, describing, or making logical predictions about character (such as protagonist or antagonist), setting, problem/solution, or plots/subplots, as appropriate to text; or identifying any significant changes in character, relationships, or setting over time; or identifying rising action, climax, or falling action (State)

- **R-10-4.2.** Paraphrasing or summarizing key ideas/plot, with major events sequenced, as appropriate to text (State)

- **R-10-4.3.** Generating questions before, during, and after reading to enhance//expand understanding and/or gaining new information (Local)

- **R-10-4.4.** Identifying the characteristics of a variety of types/genres of literary text (e.g., literary texts: poetry, plays, fairytales, fantasy, fables, realistic fiction, folktales, historical fiction, mysteries, science fiction, legends, myths, short stories, epics, novels, dramatic presentations, comedies, tragedies, satires, parodies, memoirs, epistles) (Local)

- **R-10-4.5.** Identify literary devices as appropriate to genre (e.g., similes, metaphors, alliteration, rhyme scheme, onomatopoeia, imagery, repetition, flashback, foreshadowing, personification, hyperbole, symbolism, allusion, diction, syntax, bias, or point of view) (Local)

## ANALYSIS AND INTERPRETATION OF LITERARY TEXTS/CITING EVIDENCE

### R-10-5. Analyze and interpret elements of literary texts, citing evidence where appropriate by...

- **R-10-5.1.** Explaining and supporting logical predictions or logical outcomes (e.g., drawing conclusions based on interactions between characters or evolving plot) (State)

- **R-10-5.2.** Examining characterization (e.g., stereotype, antagonist, protagonist), motivation, or interactions (including relationships), citing thoughts, words, or actions that reveal character traits, motivations, or changes over time (State)

- **R-10-5.3.** Making inferences about cause/effect, internal or external conflicts (e.g., person versus self, person versus person, person versus nature/society/fate), or the relationship among elements within text (e.g., describing the interaction among plot/subplots) (State)

- **R-10-5.4.** Explaining how the narrator's point of view or author's style is evident and affects the reader's interpretation (State)

- **R-10-5.5.** Explaining how the author's purpose (e.g., to entertain, inform or persuade) message or theme (which may include universal themes) is supported within the text (State)



**R-10-6. Analyze and interpret author's craft**, citing evidence where appropriate by...

- **R-10-6.1. Demonstrating knowledge of author's style or use of literary elements and devices** (i.e., imagery, repetition, flashback, foreshadowing, personification, hyperbole, symbolism, analogy, allusion, diction, syntax, or use of punctuation) **to analyze literary works** (State)

**R-10-16.** Generates a personal response to what is read through a variety of means...

- **R-10-16.1.** Comparing stories or other texts to related personal experience, prior knowledge, or to other books (Local)
- **R-10-16.2.** Providing relevant details to support the connections made or judgments (interpretive, analytical, evaluative, or reflective) (Local)

## INITIAL UNDERSTANDING OF INFORMATIONAL TEXT

**R-10-7. Demonstrate initial understanding of informational texts** (expository and practical texts) by...

- **R-10-7.1.** Obtaining information from text features [e.g., table of contents, glossary, index, transition words/phrases, transitional devices (including use of white space), bold or italicized text, headings, subheadings, graphic organizers, charts, graphs, or illustrations] (State)

- **R-10-7.2.** Using information from the text to answer questions; to state the main/central ideas; to provide supporting details; to explain visual components supporting the text; or, to interpret maps, charts, timelines, tables, or diagrams. (State)

- **R-10-7.3.** Organizing information to show understanding or relationships among facts, ideas, and events (e.g., representing main/central ideas or details within text through charting, mapping, paraphrasing, summarizing, comparing/contrasting, outlining) (State)

- **R-10-7.4.** Generating questions before, during, and after reading to enhance understanding and recall; expand understanding and/or gain new information (Local)
- **R-10-7.5.** Identifying the characteristics of a variety of types of text (Local)

## ANALYSIS AND INTERPRETATION OF INFORMATIONAL TEXTS/CITING EVIDENCE

**R-10-8. Analyze and interpret informational text**, citing evidence as appropriate by...

- **R-10-8.1.** Explaining connections about information within a text, across texts, or to related ideas (State)

- **R-10-8.2.** Synthesizing and evaluating information within or across text(s) (e.g., constructing appropriate titles; or formulating assertions or controlling ideas) (State)

- **R-10-8.3.** Drawing inferences about text, including author's purpose (e.g., to inform, explain, entertain, persuade) or message; or explaining how purpose may affect the interpretation of the text; or using supporting evidence to form or evaluate opinions/judgments and assertions about central ideas that are relevant (State)

- **R-10-8.4.** Distinguishing fact from opinion, and evaluating possible bias/propaganda or conflicting information within or across texts (State)

- **R-10-8.5.** Making inferences about causes and/or effects (State)

- **R-10-8.6.** Evaluating the clarity and accuracy of information (e.g. consistency, effectiveness of organizational pattern, or logic of arguments) (State)

## READING STRATEGIES: Strategies for Monitoring and Adjusting

**R-10-12.** Demonstrates ability to monitor comprehension and strategy use for different types of texts and purposes by...

- **R-10-12.1.** Using a range of self-monitoring and self-correction approaches (e.g., rereading, adjusting rate, sub-vocalizing, consulting resources, questioning, using flexible note taking/mapping systems, skimming, scanning, etc.) (Local)

## READING STRATEGIES: Reading Comprehension Strategies

**R-10-13.** Uses Comprehension strategies (flexibly and as needed) before, during, and after reading literary and informational text (Local)

## BREADTH OF READING: Reading Widely and Extensively

**R-10-14.** Demonstrates the habit of reading widely and extensively\* by...

- **R-10-14.1.** Reading with frequency, including in-school, out-of-school, and summer reading (Local)
- **R-10-14.2.** Reading from a wide range of genres/kinds of text, including primary and secondary sources, and a variety of authors (e.g., literary, informational, and practical/functional texts) (Local)
- **R-10-14.3.** Reading multiple texts for depth of understanding an author, a subject, a theme, or genre (Local)

\*Materials should be at the student's instructional and independent reading levels. The specific number of books should be viewed flexibly and is less important than the extensiveness, duration/ time and frequency of reading.

**R-10-17.** Demonstrates participation in a literate community by...

- **R-10-17.1.** Self-selecting reading materials in line with reading ability and personal interests (Local)

- **R-10-17.2.** Participating in in-depth discussions about text, ideas, and student writing by offering comments and supporting evidence, recommending books and other materials, and responding to the comments and recommendations of peers, librarians, teachers, and others (Local)

BREADTH OF READING: Reading for Research Across Content Areas

**R-10-15.** Research\*\* by reading multiple sources (including print and non-print texts) to solve a problem, or to make a decision, or to formulate a judgment, or to support a thesis by...

- **R-10-15.1.** Identifying and evaluating potential sources of information (Local)

- **R-10-15.2.** Evaluating and selecting the information presented, in terms of completeness, relevance, and validity (Local)
- **R-10-15.3.** Organizing, analyzing, and interpreting the information (Local)
- **R-10-15.4.** Drawing conclusions/judgments and supporting them with evidence (Local)

\*\*Research materials should be at the student's instructional and independent reading levels, including print and non-print texts

# NEW HAMPSHIRE Grade 12 Reading Curriculum Frameworks

## READING FLUENCY AND ACCURACY

**R-12-11.** Reads grade-level appropriate material with:

- **R-12-11.1.** Accuracy: reading material appropriate for high school with at least 90–94% accuracy (Local)
- **R-12-11.2.** Fluency: reading with appropriate silent and oral reading fluency rates as determined by text demands, and purpose for reading (Local)
- **R-12-11.3.** Fluency: reading familiar text with phrasing and expression, and with attention to text features such as punctuation, italics, and dialogue (Local)

## WORD IDENTIFICATION SKILLS AND STRATEGIES

**R-12-1.** Applies word identification/ decoding strategies by...

- **R-12-1.1.** Identifying multi-syllabic words by using knowledge of sounds, syllable division, and word patterns (Local)

## VOCABULARY STRATEGIES AND BREADTH OF VOCABULARY

**R-12-2.** Students identify the meaning of unfamiliar vocabulary by...

- **R-12-2.1.** Using strategies to unlock meaning (e.g., knowledge of word structure, including prefixes/suffixes, common roots, or word origins; or context clues; or resources including dictionaries, glossaries, or thesauruses to determine definition, pronunciation, etymology, or usage of words; or prior knowledge) (Local)
- **R-12-2.1.b.** Using strategies to unlock meaning including base words, general and specialized print or electronic resources to determine definition, pronunciation, etymology, or usage of words; or prior knowledge (Local)

**R-12-3.** Shows breadth of vocabulary knowledge through demonstrating understanding of word meanings and relationships by...

- **R-12-3.1.** Identifying synonyms, antonyms, homonyms/homophones, shades of meaning, analogies, idioms, or word origins, including words from dialects, or other languages that have been adopted into standard English (Local)
- **R-12-3.2.** Selecting appropriate words or explaining the use of words in context, including connotation or denotation, shades of meanings of words/nuances, or idioms; or use of content-specific vocabulary, words with multiple meanings, precise language, or technical vocabulary (Local)

## INITIAL UNDERSTANDING OF LITERARY TEXTS

**R-12-4.** Demonstrate initial understanding of elements of literary texts by...

- **R-12-4.1.** Identifying, describing, or making logical predictions about character (such as protagonist or

antagonist), setting, problem/solution, or plots/subplots, as appropriate to text; or identifying any significant changes in character, relationships, or setting over time; or identifying rising action, climax, or falling action (Local)

- **R-12-4.2.** Paraphrasing or summarizing key ideas/plot, with major events sequenced, as appropriate to text (Local)
- **R-12-4.3.** Generating questions before, during, and after reading to enhance understanding and recall enhance/expand understanding and/or gaining new information (Local)
- **R-12-4.4.** Identifying the characteristics of a variety of types/genres of literary text (e.g., literary texts: poetry, plays, fairytales, fantasy, fables, realistic fiction, folktales, historical fiction, mysteries, science fiction, legends, myths, short stories, epics, novels, dramatic presentations, comedies, tragedies, satires, parodies, memoirs, epistles) (Local)
- **R-12-4.5.** Identify literary devices as appropriate to genre (e.g., similes, metaphors, alliteration, rhyme scheme, onomatopoeia, imagery, repetition, flashback, foreshadowing, personification, hyperbole, symbolism, allusion, diction, syntax, bias, or point of view) (Local)

## ANALYSIS AND INTERPRETATION OF LITERARY TEXTS/CITING EVIDENCE

**R-12-5.** Analyze and interpret literary elements within or across texts, citing evidence where appropriate by...

- **R-12-5.1.** Explaining and supporting logical predictions or logical outcomes (e.g., drawing conclusions based on interactions between characters or evolving plot) (Local)
- **R-12-5.2.** Examining characterization (e.g., stereotype, antagonist, protagonist), motivation, or interactions (including relationships), citing thoughts, words, or actions that reveal character traits, motivations, or changes over time (Local)
- **R-12-5.3.** Making inferences about cause/effect, internal or external conflicts (e.g., person versus self, person versus person, person versus nature/society/fate), or the relationship among elements within text(s) (e.g., describing the interaction among plot/subplots, theme/setting, symbolism/characterization) (Local)
- **R-12-5.4.** Explaining how the narrator's point of view, or author's style, or tone is evident and affects the reader's interpretation or is supported throughout the text(s) (Local)
- **R-12-5.5.** Explaining how the author's purpose (e.g., to entertain, inform or persuade) message or theme (which may include universal themes) is supported within the text(s) (Local)

**R-12-6.** Analyze and interpret author's craft within or across texts, citing evidence where appropriate by...

- **R-12-6.1a.** Demonstrating knowledge of author's style or use of literary elements and devices (e.g., simile,

metaphor, point of view, imagery, repetition, flashback, foreshadowing, personification, hyperbole, symbolism, analogize allusion, diction, syntax, genre, or bias, or use of punctuation, etc.) **to analyze literary works** (Local)

- **R-12-6.1b. Examining author's style or use of literary devices to convey theme** (Local)

**R-12-16.** Generates a personal response to what is read through a variety of means...

- **R-12-16.1.** Comparing stories or other texts to related personal experience, prior knowledge, or to other books (Local)
- **R-12-16.2.** Providing relevant details to support the connections made or judgments (interpretive, analytical, evaluative, or reflective) (Local)

## INITIAL UNDERSTANDING OF INFORMATIONAL TEXT

**R-12-7. Demonstrate initial understanding of informational texts (expository and practical texts) by...**

- **R-12-7.1.** Obtaining information from text features [e.g., table of contents, glossary, index, transition words/phrases, transitional devices (including use of white space), bold or italicized text, headings, subheadings, graphic organizers, charts, graphs, or illustrations] (Local)
- **R-12-7.2. Using information from the text to answer questions, perform specific tasks, or solve problems; to state the main/central ideas; to provide supporting details;** to explain visual components supporting the text; or to interpret maps, charts, timelines, tables, or diagrams (Local)
- **R-12-7.3. Organizing information to show understanding or relationships among facts, ideas, and events** (e.g., representing main/central ideas or details within text through charting (including flowcharts), mapping, paraphrasing, summarizing, comparing/contrasting, outlining, or connecting information with related ideas, etc. (Local)
- **R-12-7.4.** Generating questions before, during, and after reading to enhance understanding and recall; expand understanding and/or gain new information (Local)
- **R-12-7.5.** Identifying the characteristics of a variety of types of text (e.g., reference), public documents (drivers' manuals) and discourse, essays (including literary criticisms), articles, technical manuals, editorials/commentaries, primary source documents, periodicals, job-related materials, speeches, on-line reading, documentaries; and practical/functional (Local)

## ANALYSIS AND INTERPRETATION OF INFORMATIONAL TEXTS/CITING EVIDENCE

**R-12-8. Analyze and interpret informational text** (which may include technical writing), citing evidence as appropriate by...

- **R-12-8.1.** Explaining connections among ideas across multiple texts (Local)

- **R-12-8.2. Synthesizing and evaluating information within or across text(s)** (e.g., constructing appropriate titles; or formulating assertions or controlling ideas) (Local)
- **R-12-8.3. Drawing inferences about text, including author's purpose** (e.g., to inform, explain, entertain, persuade) or message; or explaining how purpose may affect the interpretation of the text; or using supporting evidence to form or evaluate opinions/judgments and assertions about central ideas that are relevant (Local)
- **R-12-8.4.** Critiquing author's use of strategies to achieve intended purpose or message (e.g., to inform, explain, entertain, persuade) (Local)
- **R-12-8.5. Making inferences about causes and effects** (Local)
- **R-12-8.6.** Evaluating the clarity and accuracy of information (e.g. consistency, effectiveness of organizational pattern, or logic of arguments) (Local)

## READING STRATEGIES: Strategies for Monitoring and Adjusting

**R-12-12.** Demonstrates ability to monitor comprehension and strategy use for different types of texts and purposes by...

- **R-12-12.1.** Using a range of self-monitoring and self-correction approaches (e.g., rereading, adjusting rate, sub-vocalizing, consulting resources, questioning, using flexible note taking/mapping systems, skimming, scanning, etc.) (Local)

## READING STRATEGIES: Reading Comprehension Strategies

**R-12-13. Uses Comprehension strategies** (flexibly and as needed) before, during, and after reading literary and informational text (Local)

## BREADTH OF READING: Reading Widely and Extensively

**R-12-14.** Demonstrates the habit of reading widely and extensively\* by...

- **R-12-14.1.** Reading with frequency, including in-school, out-of-school, and summer reading (Local)
- **R-12-14.2.** Reading from a wide range of genres/ kinds of text, including primary and secondary sources, and a variety of authors (e.g., literary, informational, and practical/functional texts) (Local)
- **R-12-14.3.** Reading multiple texts for depth of understanding an author, a subject, a theme, or genre (Local)

\*Materials should be at the student's instructional and independent reading levels. The specific number of books should be viewed flexibly and is less important than the extensiveness, duration/ time and frequency of reading.

**R-12-17.** Demonstrates participation in a literate community by...

- **R-12-17.1.** Self-selecting reading materials in line with reading ability and personal interests (Local)

- **R-12-17.2.** Participating in in-depth discussions about text, ideas, and student writing by offering comments and supporting evidence, recommending books and other materials, and responding to the comments and recommendations of peers, librarians, teachers, and others (Local)

#### BREADTH OF READING: Reading for Research Across Content Areas

**R-12-15.** Research\*\* by reading multiple sources (including print and non-print texts) to solve a problem, or to make a decision, or to formulate a judgment, or to support a thesis by...

- **R-12-15.1.** Identifying and evaluating potential sources of information (Local)

- **R-12-15.2.** Evaluating and selecting the information presented, in terms of completeness, relevance, and validity (Local)
- **R-12-15.3.** Organizing, analyzing, and interpreting the information (Local)
- **R-12-15.4.** Drawing conclusions/judgments and supporting them with evidence (Local)

\*\*Research materials should be at the student's instructional and independent reading levels, including print and non-print texts.

## NEW HAMPSHIRE Grade 8 Written and Oral Communication Curriculum Frameworks

HABIT OF WRITING: Uses a Writing Process  
[LOCAL ONLY]

**W-8-10.** Students use a recursive process, including pre-writing, drafting, revising, editing, and critiquing to produce final drafts of written products. (Local)

HABIT OF WRITING: Writing Extensively  
[LOCAL ONLY]

**W-8-11.** Demonstrates the habit of writing extensively by...

- **W-8-11.1.** Writing with frequency, including in-school, out-of-school, and during the summer (Local)
- **W-8-11.2.** Sharing thoughts, observations, or impressions (Local)
- **W-8-11.3.** Generating topics for writing (Local)
- **W-8-11.4.** Writing in a variety of genres (Local)

STRUCTURES OF LANGUAGE: Applying Understanding of Sentences, Paragraphs, Text Structures

**W-8-1.** Students demonstrate command of the structures of sentences, paragraphs, and text by...

- **W-8-1.1.** Using varied sentence length and structure to enhance meaning (e.g., including phrases and clauses) (Local)
- **W-8-1.2.** Using the paragraph form: indenting, main idea, supporting details (Local)
- **W-8-1.3.** Recognizing organizational structures within paragraphs or within texts (Local)
- **W-8-1.4.** Applying a format and text structure appropriate to the purpose of the writing (Local)
- **W-8-1.5.** [Subsumed in W-8-1.1.]
- **W-8-1.6.** Applying directionality as appropriate to text (Local)

WRITING IN RESPONSE TO LITERARY OR INFORMATIONAL TEXT: Showing Understanding of Ideas in Text

**W-8-2.** In response to literary or informational text, students show understanding of plot/ideas/concepts by...

- **W-8-2.1.** Selecting and summarizing key ideas to set context (Local)
- **W-8-2.2.** [Subsumed in W-8-2.1.]
- **W-8-2.3.** Connecting what has been read (plot/ideas/concepts) to prior knowledge, other texts, or the broader world of ideas, by referring to and explaining relevant ideas (Local)
- **W-8-2.4** [Not assessed at this grade level]

WRITING IN RESPONSE TO LITERARY OR INFORMATIONAL TEXT: Making Analytical Judgments about Text

**W-8-3.** In response to literary or informational text, students make and support analytical judgments about text by...

- **W-8-3.1.** Stating and maintaining a focus (purpose), a firm judgment, or point of view when responding to a given question (Local)
- **W-8-3.2.** Making inferences about the relationship(s) among content, events, characters, setting, theme, or author's craft (Local)
- **W-8-3.3.** Using specific details and references to text or relevant citations to support focus or judgment (Local)
- **W-8-3.4.** Organizing ideas, using transitional words/phrases and drawing a conclusion by synthesizing information (e.g., demonstrate a connection to the broader world of ideas) (Local)

EXPRESSIVE WRITING: Narrative—Creating a Story Line

**W-8-4.** In written narratives, students organize and relate a story line/plot/series of events by...

- **W-8-4.1.** Creating a clear and coherent (logically consistent) story line (Local)
- **W-8-4.2.** Establishing context, character motivation, problem/conflict/challenge, and resolution, and maintaining point of view (Local)
- **W-8-4.3.** Using a variety of effective transitional devices (e.g., ellipses, time transitions, white space, or words/phrases) to enhance meaning (Local)
- **W-8-4.4.** [Not assessed at this grade level]
- **W-8-4.5.** Establishing and maintaining a theme (Local)
- **W-8-4.6.** Providing a sense of closure (Local)

EXPRESSIVE WRITING: Narrative—Applying Narrative Strategies

**W-8-5.** Students demonstrate use of narrative strategies by...

- **W-8-5.1.** Creating images, using details and sensory language to advance the plot/story line (Local)
- **W-8-5.2.** Using dialogue to advance plot/story line (Local)
- **W-8-5.3.** Developing characters through description, dialogue, actions, and relationships with other characters, when appropriate (Local)
- **W-8-5.4.** Using voice appropriate to purpose (Local)
- **W-8-5.5.** Maintaining focus (Local)
- **W-8-5.6.** Selecting and elaborating important ideas; and excluding extraneous details (Local)
- **W-8-5.7.** Controlling the pace of the story (Local)

## EXPRESSIVE WRITING: Poetry

**W-8-12.** In writing poetry, students demonstrate awareness of purpose by...

- **W-8-12.1.** Writing poems in a variety of voices for a variety of audiences (purpose) (Local)
- **W-8-12.2.** Writing poems that express speaker's moods, thoughts, or feelings (Local)
- **W-8-12.3.** Choosing conventional or alternative text structures to achieve impact (Local)

**W-8-13.** In writing poetry, use language effectively by...

- **W-8-13.1.** Selecting vocabulary according to purpose and for effect on audience (Local)
- **W-8-13.2.** Using rhyme, figurative language (Local)
- **W-8-13.3.** [Not assessed at this grade level]
- **W-8-13.4.** Using a variety of poetic forms (Local)

## EXPRESSIVE WRITING: Reflective Essay

**W-8-14.** In reflective writing, students explore and share thoughts, observations, and impressions by...

- **W-8-14.1.** Engaging the reader by establishing context (purpose) (Local)
- **W-8-14.2.** Analyzing a condition or situation of significance (e.g., reflecting on a personal learning or personal growth), or developing a commonplace, concrete occasion as the basis for the reflection (Local)
- **W-8-14.3.** [Not assessed at this grade level]
- **W-8-14.4.** Using a range of elaboration techniques (i.e., questioning, comparing, connecting, interpreting, analyzing, or describing) to establish a focus (Local)
- **W-8-14.5.** Providing closure—leaving the reader with something to think about (Local)

## INFORMATIONAL WRITING: Reports, Procedures, or Persuasive Writing—Organizing and Conveying Information

**W-8-6.** In informational writing, students organize ideas/concepts by...

- **W-8-6.1.** Using an organizational text structure appropriate to focus/controlling idea (Local)
- **W-8-6.2.** Selecting appropriate information to set context, which may include a lead/hook (Local)

**W-8-7.** In informational writing, students effectively convey purpose by...

- **W-8-7.1.** Establishing a topic (Local)
- **W-8-7.2.** Stating and maintaining a focus/controlling idea/thesis (Local)
- **W-8-7.3.** Writing with a sense of audience, when appropriate (Local)
- **W-8-7.4.** Establishing an authoritative voice (Local)
- **W-8-7.5.** [Not assessed at this grade level]

## INFORMATIONAL WRITING (REPORTS, PROCEDURES, OR PERSUASIVE WRITING): Using Elaboration Strategies

**W-8-8.** In informational writing, students demonstrate use of a range of elaboration strategies by...

- **W-8-8.1.** Including facts and details relevant to focus/controlling idea, and excluding extraneous information (Local)
- **W-8-8.2.** Including sufficient details or facts for appropriate depth of information: naming, describing, explaining, comparing, use of visual images (Local)
- **W-8-8.3.** Addressing readers' concerns (including counterarguments in persuasive writing; addressing potential problems in procedures; providing context in reports) (Local)
- **W-8-8.4.** Commenting on the significance of the information, when appropriate (Local)

## WRITING CONVENTIONS: Applying Rules of Grammar, Usage, and Mechanics

**W-8-9.** In independent writing, students demonstrate command of appropriate English conventions by...

- **W-8-9.1.** Applying rules of standard English usage to correct grammatical errors (Local)
- **W-8-9.2.** Applying capitalization rules (Local)
- **W-8-9.3.** [Subsumed in W-8-9.4.]
- **W-8-9.4.** Applying appropriate punctuation to various sentence patterns to enhance meaning (Local)
- **W-8-9.5.** Applying conventional and word-derivative spelling patterns/rules (Local)

## ORAL COMMUNICATION STRATEGIES: Interactive Listening Draft for Public Review and Feedback

**OC-8-1.** In oral communication, students demonstrate interactive listening by...

- **OC-8-1.1.** Following verbal instructions to perform specific tasks, to answer questions, or to solve problems (Local)
- **OC-8-1.2.** Summarizing, paraphrasing, questioning, or contributing to information presented (Local)
- **OC-8-1.3.** [Not assessed at this grade level]
- **OC-8-1.4.** Participating in large and small group discussions showing respect for a range of individual ideas (Local)
- **OC-8-1.5.** Reaching consensus to solve a problem, make a decision, or achieve a goal (Local)

## ORAL COMMUNICATION STRATEGIES: Making Presentations Draft for Public Review and Feedback

**OC-8-2.** In oral communication, students make oral presentations by...

- **OC-8-2.1.** Exhibiting logical organization and language use, appropriate to audience, context, and purpose (Local)

- **OC-8-2.2.** Maintaining a consistent focus (Local)
- **OC-8-2.3.** Including smooth transitions, supporting thesis with well-chosen details, and providing a coherent conclusion (Local)
- **OC-8-2.4.** Effectively responding to audience questions and feedback (Local)
- **OC-8-2.5.** Using a variety of strategies of address (e.g., eye contact, speaking rate, volume, articulation, inflection, intonation, rhythm, and gesture) to communicate ideas effectively (Local)
- **OC-8-2.6.** [Not assessed at this grade level]



## NEW HAMPSHIRE Grade 10 Written and Oral Communication Curriculum Frameworks

HABIT OF WRITING: Uses a Writing Process [LOCAL ONLY]

**W-10-10.** Students use a recursive process, including pre-writing, drafting, revising, editing, and critiquing to produce final drafts of written products. (Local)

HABIT OF WRITING: Writing Extensively [LOCAL ONLY]

**W-10-11.** Demonstrates the habit of writing extensively by...

- **W-10-11.1.** Writing with frequency, including in-school, out-of-school, and during the summer (Local)
- **W-10-11.2.** Sharing thoughts, observations, or impressions (Local)
- **W-10-11.3.** Generating topics for writing (Local)
- **W-10-11.4.** Writing in a variety of genres (Local)

STRUCTURES OF LANGUAGE: Applying Understanding of Sentences, Paragraphs, Text Structures

**W-10-1.** Students demonstrate command of the structures of sentences, paragraphs, and text by...

- **W-10-1.1.** Using varied sentence length and structure to enhance meaning (e.g., including phrases and clauses) (State)
- **W-10-1.2.** Using paragraph structures appropriately (e.g., block or indented format) (Local)

• **W-10-1.3.** Recognizing organizational structures within paragraphs or within texts (State)

- **W-10-1.4.** Applying a format and text structure appropriate to purpose, audience, and context (State)
- **W-10-1.5.** [Subsumed in W-10-1.1]
- **W-10-1.6.** Applying directionality as appropriate to text (Local)

WRITING IN RESPONSE TO LITERARY OR INFORMATIONAL TEXT: Showing Understanding of Ideas in Text

**W-10-2.** In response to literary or informational text, students show understanding of plot/ideas/concepts by...

- **W-10-2.1.** Selecting and summarizing key ideas to set context, appropriate to audience (State)
- **W-10-2.2.** [Subsumed in W-10-2.1]

• **W-10-2.3.** Connecting what has been read (plot/ideas/concepts) to prior knowledge, other texts, or the broader world of ideas, by referring to and explaining relevant ideas or themes (State)

- **W-10-2.4.** [Not assessed at this grade level]

WRITING IN RESPONSE TO LITERARY OR INFORMATIONAL TEXT: Making Analytical Judgments about Text

**W-10-3.** In response to literary or informational text, students make and support analytical judgments about text by...

- **W-10-3.1a.** Establishing an interpretive claim/assertion in the form of a thesis (purpose), when responding to a given prompt (State)
- **W-10-3.1b.** Establishing an interpretive claim/assertion in the form of a thesis (purpose) (Local)

• **W-10-3.2.** Making inferences about the relationship(s) among content, events, characters, setting, theme, or author's craft (State)

• **W-10-3.3.** Using specific details and references to text or relevant citations to support thesis, interpretations, or conclusions (State)

• **W-10-3.4.** Organizing ideas, using transitional words/phrases and drawing a conclusion by synthesizing information (e.g., demonstrate a connection to the broader world of ideas) (State)

EXPRESSIVE WRITING: Narrative Creating a Story Line

**W-10-4.** In written narratives, students organize and relate a story line/plot/series of events by...

- **W-10-4.1.** Creating a clear and coherent (logically consistent) story line (Local)
- **W-10-4.2.** Establishing context, character motivation, problem/conflict/challenge, and resolution, significance of setting, and maintaining point of view (Local)
- **W-10-4.3.** Using a variety of effective transitional devices (e.g., ellipses; time transitions: such as flashback or foreshadowing; white space; or words/phrases) to enhance meaning (Local)
- **W-10-4.4.** Using a variety of effective literary devices (i.e., flashback or foreshadowing, figurative language imagery) to enhance meaning (Local)
- **W-10-4.5.** Establishing and maintaining theme (Local)
- **W-10-4.6.** Providing a sense of closure (Local)

EXPRESSIVE WRITING: Narrative Applying Narrative Strategies

**W-10-5.** Students demonstrate use of narrative strategies to engage the reader by...

- **W-10-5.1.** Creating images, using relevant and descriptive details and sensory language to advance the plot/story line (Local)
- **W-10-5.2.** Using dialogue to advance plot/story line (Local)

- **W-10-5.3.** Developing characters through description, dialogue, actions, and relationships with other characters, when appropriate (Local)
- **W-10-5.4.** Using voice appropriate to purpose (Local)
- **W-10-5.5.** **Maintaining focus** (Local)
- **W-10-5.6.** **Selecting and elaborating important ideas; and excluding extraneous details** (Local)
- **W-10-5.7.** Controlling the pace of the story (Local)

#### EXPRESSIVE WRITING: Poetry

**W-10-12.** In writing poetry, students demonstrate awareness of purpose by...

- **W-10-12.1.** Writing poems in a variety of voices for a variety of audiences (purpose) (Local)
- **W-10-12.2.** Writing poems that express speaker's moods, thoughts, or feelings (Local)
- **W-10-12.3.** Choosing conventional or alternative text structures to achieve impact (Local)

**W-10-13.** In writing poetry, use language effectively by...

- **W-10-13.1.** Selecting vocabulary according to purpose and for effect on audience (Local)
- **W-10-13.2.** Using rhyme, rhythm, meter, literary elements (e.g., setting, plot, characters) or figurative language (Local)
- **W-10-13.3.** Selecting and manipulating words, phrases, or clauses, for connotation/shades of meaning and impact (Local)
- **W-10-13.4.** Using a variety of poetic forms (Local)

#### EXPRESSIVE WRITING: Reflective Essay

**W-10-14.** **In reflective writing, students** explore and share thoughts, observations, and impressions by...

- **W-10-14.1.** Engaging the reader by **establishing context (purpose)** (State)
- **W-10-14.2.** Analyzing a condition or situation of significance (e.g., reflecting on a personal learning or personal growth), or developing a commonplace, concrete occasion as the basis for the reflection (State)
- **W-10-14.3.** **Using an organizational structure that allows for a progression of ideas to develop** (State)
- **W-10-14.4.** **Using a range of elaboration techniques** (i.e., questioning, comparing, connecting, interpreting, analyzing, or describing) **to establish a focus** (State)
- **W-10-14.5.** **Providing closure** - leaving the reader with something to think about (State)
- **W-10-14.6.** [Not assessed at this grade level]

#### INFORMATIONAL WRITING: Reports, Procedures, or Persuasive Writing Organizing and Conveying Information

**W-10-6.** **In informational writing, students organize ideas/concepts by...**

- **W-10-6.1.** **Using a text structure appropriate to focus/controlling idea** or thesis (e.g., purpose, audience, context) (State)

- **W-10-6.2.** **Selecting appropriate and relevant information (excluding extraneous details) to set context** (State)

**W-10-7.** **In informational writing, students effectively convey purpose by...**

- **W-10-7.1.** Establishing a topic (State)

- **W-10-7.2.** Stating and **maintaining a focus/controlling idea/thesis** (State)

- **W-10-7.3.** Writing with a sense of audience, when appropriate (State)

- **W-10-7.4.** Establishing an authoritative voice (State)

- **W-10-7.5.** **Using precise and descriptive language that clarifies and supports intent** (State)

#### INFORMATIONAL WRITING (REPORTS, PROCEDURES, OR PERSUASIVE WRITING): Using Elaboration Strategies

**W-10-8.** **In informational writing, students demonstrate use of a range of elaboration strategies by...**

- **W-10-8.1.** **Including facts and details relevant to focus/controlling idea or thesis, and by excluding extraneous information** (State)

- **W-10-8.2.** Including sufficient details or facts for appropriate depth of information: naming, describing, explaining, comparing, contrasting, or using visual images to support intended purpose (State)

- **W-10-8.3.** Addressing readers' concerns (anticipating and addressing potential problems, mistakes, or misunderstandings that might arise for the audience)(State)

- **W-10-8.4.** Commenting on the significance of the information (in reports, throughout the piece; in procedural or persuasive writing, as appropriate) (State)

## WRITING CONVENTIONS: Applying Rules of Grammar, Usage, and Mechanics

**W-10-9.** In independent writing, students demonstrate command of appropriate English conventions by...

- **W-10-9.1.** Applying rules of standard English usage to correct grammatical errors (State)

- **W-10-9.2.** Applying capitalization rules (Local)

- **W-10-9.3.** [Subsumed in W-10-9.4]

• **W-10-9.4.** Applying appropriate punctuation to various sentence patterns to enhance meaning (State)

- **W-10-9.5.** Applying conventional and word-derivative spelling patterns/rules (Local)

## ORAL COMMUNICATION STRATEGIES: Interactive Listening Draft for Public Review and Feedback

**OC-10-1.** In oral communication, students demonstrate interactive listening by...

- **OC-10-1.1.** Following verbal instructions, to perform specific tasks, to answer questions, or to solve problems (Local)
- **OC-10-1.2.** Summarizing, paraphrasing, questioning, or contributing to information presented (Local)
- **OC-10-1.3.** Identifying the thesis of a presentation, determining the essential elements of elaboration, and interpreting or evaluating the message (Local)

- **OC-10-1.4.** Participating in large and small group discussions showing respect for a range of individual ideas (Local)
- **OC-10-1.5.** Reaching consensus to solve a problem, make a decision, or achieve a goal (Local)

## ORAL COMMUNICATION STRATEGIES: Making Presentations Draft for Public Review and Feedback

**OC-10-2.** In oral communication, students make oral presentations by...

- **OC-10-2.1.** Exhibiting logical organization and language use, appropriate to audience, context, and purpose (Local)
- **OC-10-2.2.** Maintaining a consistent focus (Local)
- **OC-10-2.3.** Including smooth transitions, supporting thesis with well-chosen details, and providing a coherent conclusion (Local)
- **OC-10-2.4.** Effectively responding to audience providing effective and appropriate feedback to audience and small groups and effectively responding to audience questions and feedback questions and feedback (Local)
- **OC-10-2.5.** Using a variety of strategies of address (e.g., eye contact, speaking rate, volume, articulation, enunciation, pronunciation, inflection, voice modulation, intonation, rhythm, and gesture) to communicate ideas effectively (Local)
- **OC-10-2.6.** Using tools of technology to enhance message (Local)

## NEW HAMPSHIRE Grade 12 Written and Oral Communication Curriculum Frameworks

HABIT OF WRITING: Uses a Writing Process  
[LOCAL ONLY]

**W.12.10.** Students use a recursive process, including pre-writing, drafting, revising, editing, and critiquing to produce final drafts of written products (Local)

HABIT OF WRITING: Writing Extensively  
[LOCAL ONLY]

**W.12.11.** Demonstrates the habit of writing extensively by...

- **W.12.11.1** Writing with frequency, including in-school, out-of-school, and during the summer (Local)
- **W.12.11.2.** Sharing thoughts, observations, or impressions (Local)
- **W.12.11.3.** Generating topics for writing (Local)
- **W.12.11.4.** Writing in a variety of genres (Local)

STRUCTURES OF LANGUAGE: Applying Understanding of Sentences, Paragraphs, Text Structures

**W.12.1** Students demonstrate command of the structures of sentences, paragraphs, and text by...

- **W.12.1.1.** Using varied sentence length and structure to enhance meaning (e.g., including phrases, clauses, and parallel structure) (Local)
- **W.12.1.2.** Using paragraph structures appropriately (e.g., block or indented format) (Local)
- **W.12.1.3.** Recognizing organizational structures within paragraphs or within texts (Local)
- **W.12.1.4.** Applying a format and text structure appropriate to purpose, audience, and context (Local)
- **W.12.1.5.** [Subsumed in W.12.1.1]
- **W.12.1.6.** Applying directionality as appropriate to text (Local)

WRITING IN RESPONSE TO LITERARY OR INFORMATIONAL TEXT: Showing Understanding of Ideas in Text

**W.12.2.** In response to literary or informational text, students show understanding of plot /ideas/concepts within or across texts by...

- **W.12.2.1.** Selecting and summarizing key ideas to set context, appropriate to audience (Local)
- **W.12.2.2.** [Subsumed in W.12.2.1]
- **W.12.2.3.** Connecting what has been read (plot/ideas/concepts) to prior knowledge, other texts, or the broader world of ideas, by referring to and explaining relevant ideas, themes, motifs, or archetypes (Local)
- **W.12.2.4.** Explaining the visual components (e.g., charts, diagrams, artwork) of the text, when appropriate (Local)

WRITING IN RESPONSE TO LITERARY OR INFORMATIONAL TEXT—MAKING ANALYTICAL JUDGMENTS ABOUT TEXT

**W.12.3.** In response to literary or informational text, students make and support analytical judgments about text by...

- **W.12.3.1b.** Establishing an interpretive claim/assertion in the form of a thesis (purpose) (Local)
- **W.12.3.2.** Making inferences about the relationship(s) among content, events, characters, setting, theme, or author's craft (Local)
- **W.12.3.3.** Using specific details and references to text or relevant citations to support thesis, interpretations, or conclusions (Local)
- **W.12.3.4.** Organizing ideas, using transitional words/phrases and drawing a conclusion by synthesizing information (e.g., demonstrate a connection to the broader world of ideas) (Local)

EXPRESSIVE WRITING: Narrative—Creating a Story Line

**W.12.4.** In written narratives, students organize and relate a story line/plot/series of events by...

- **W.12.4.1.** Creating a clear and coherent, logically consistent structure (Local)
- **W.12.4.2.** Establishing context, character motivation, problem/conflict/challenge, and resolution, significance of setting, and maintaining point of view (Local)
- **W.12.4.3.** Using a variety of effective transitional devices (e.g., ellipses; time transitions: such as flashback or foreshadowing; white space; or words/phrases) to enhance meaning (Local)
- **W.12.4.4.** Using a variety of effective literary devices (i.e., flashback or foreshadowing, figurative language imagery) to enhance meaning (Local)
- **W.12.4.5.** Establishing and maintaining theme (Local)
- **W.12.4.6.** Providing a sense of closure (Local)

EXPRESSIVE WRITING: Narrative—Applying Narrative Strategies

**W.12.5.** Students demonstrate use of narrative strategies to engage the reader by...

- **W.12.5.1.** Creating images, using relevant and descriptive details and sensory language to advance the plot/story line (Local)
- **W.12.5.2.** Using dialogue to advance plot/story line (Local)
- **W.12.5.3.** Developing characters through description, dialogue, actions (including gestures, expressions), and relationships with other characters, when appropriate (Local)
- **W.12.5.4.** Using voice appropriate to purpose (Local)
- **W.12.5.5.** Maintaining focus (Local)

- **W.12.5.6.** Selecting and elaborating important ideas; and excluding extraneous details (Local)
- **W.12.5.7.** Controlling the pace of the story (Local)

### EXPRESSIVE WRITING: Poetry

**W.12.12.** In writing poetry, students demonstrate awareness of purpose by...

- **W.12.12.1.** Writing poems in a variety of voices for a variety of audiences (purpose) (Local)
- **W.12.12.2.** Writing poems that express speaker's moods, thoughts, or feelings (Local)
- **W.12.12.3.** Choosing conventional or alternative text structures to achieve impact (Local)

**W.12.13** In writing poetry, use language effectively by...

- **W.12.13.1.** Selecting vocabulary according to purpose and for effect on audience (Local)
- **W.12.13.2.** Using rhyme, rhythm, meter, literary elements (e.g., setting, plot, characters) or figurative language (Local)
- **W.12.13.3.** Selecting and manipulating words, phrases, or clauses, for connotation/shades of meaning and impact (Local)
- **W.12.13.4.** Using a variety of poetic forms (Local)

### EXPRESSIVE WRITING: Reflective Essay

**W.12.14.** In reflective writing, students explore and share thoughts, observations, and impressions by...

- **W.12.14.1.** Engaging the reader by establishing context (purpose) (Local)
- **W.12.14.2.** Analyzing a condition or situation of significance or developing a commonplace, concrete occasion as the basis for the reflection (Local)
- **W.12.14.3.** Using an organizational structure that allows for a progression of ideas to develop (Local)
- **W.12.14.4.** Using a range of elaboration techniques (i.e., questioning, comparing, connecting, interpreting, analyzing, or describing) to establish a focus (Local)
- **W.12.14.5.** Providing closure—leaving the reader with something to think about (Local)
- **W.12.14.6.** Making connections between personal ideas and experiences and more abstract aspects of life, leading to new perspectives or insights (Local)

### INFORMATIONAL WRITING: Reports, Procedures, or Persuasive Writing—Organizing and Conveying Information

**W.12.6.** In informational writing, students organize ideas/concepts by...

- **W.12.6.1.** Using a text structure appropriate to focus/controlling idea or thesis (e.g., purpose, audience, context) (Local)
- **W.12.6.2.** Selecting appropriate and relevant information (excluding extraneous details) to set context (Local)

**W.12.7.** In informational writing, students effectively convey purpose by...

- **W.12.7.1.** Establishing a topic (Local)
- **W.12.7.2.** Stating and maintaining a focus/controlling idea/thesis (Local)
- **W.12.7.3.** Selecting and using formal, informal, literary, or technical language appropriate to audience and context (Local)
- **W.12.7.4.** Establishing an authoritative voice (Local)
- **W.12.7.5.** Using precise and descriptive language that clarifies and supports intent and enhances meaning (Local)

### INFORMATIONAL WRITING (REPORTS, PROCEDURES, OR PERSUASIVE WRITING): Using Elaboration Strategies

**W.12.8.** In informational writing, students demonstrate use of a range of elaboration strategies by...

- **W.12.8.1.** Including facts and details relevant to focus/controlling idea or thesis, and excluding extraneous information (Local)
- **W.12.8.2.** Including sufficient details or facts for appropriate depth of information: naming, describing, explaining, comparing, contrasting, or using visual images to support intended purpose (Local)
- **W.12.8.3.** Addressing readers' concerns (anticipating and addressing potential problems, mistakes, or misunderstandings that might arise for the audience)(Local)
- **W.12.8.4.** Commenting on the significance of the information (in reports, throughout the piece; in procedural or persuasive writing, as appropriate) (Local)

### WRITING CONVENTIONS: Applying Rules of Grammar, Usage, and Mechanics

**W.12.9.** In independent writing, students demonstrate command of appropriate English conventions by...

- **W.12.9.1.** Applying rules of standard English usage to correct grammatical errors (Local)
- **W.12.9.2.** Applying capitalization rules (Local)
- **W.12.9.3.** [Subsumed in W.12.9.4]
- **W.12.9.4.** Applying appropriate punctuation to various sentence patterns to enhance meaning (Local)
- **W.12.9.5.** Applying conventional and word-derivative spelling patterns/rules (Local)

### ORAL COMMUNICATION STRATEGIES: Interactive Listening Draft for Public Review and Feedback

**OC-12-1.** In oral communication, students demonstrate interactive listening by...

- **OC-12-1.1.** Following verbal instructions to perform specific tasks, to answer questions, or to solve problems (Local)
- **OC-12-1.2.** Summarizing, paraphrasing, questioning, or contributing to information presented to advance understanding (Local)

- **OC-12-1.3.** Identifying the thesis of a presentation, determining the essential elements of elaboration, and interpreting or evaluating the message (Local)
- **OC-12-1.4.** Participating in large and small group discussions showing respect for individual ideas (Local)
- **OC-12-1.5.** Reaching consensus to solve a problem, make a decision, or achieve a goal (Local)

**ORAL COMMUNICATION STRATEGIES:**  
**Making Presentations Draft for Public Review and Feedback**

**OC-12-2.** In oral communication, students make oral presentations by...

- **OC-12-2.1.** Exhibiting logical organization and language use, appropriate to audience, context, and purpose (Local)

- **OC-12-2.2.** Maintaining a consistent focus (Local)
- **OC-12-2.3.** Including smooth transitions, supporting thesis with well-chosen details, and providing a coherent conclusion (Local)
- **OC-12-2.4.** Effectively responding to audience questions and feedback (Local)
- **OC-12-2.5.** Using a variety of strategies of address (e.g., eye contact, speaking rate, volume, articulation, enunciation, pronunciation, inflection, voice modulation, intonation, rhythm, and gesture) to communicate ideas effectively (Local)
- **OC-12-2.6.** Using tools of technology to enhance message (Local)

## Mathematics

### NEW HAMPSHIRE Grade 8 Mathematics Curriculum Frameworks

#### Number and Operations

**M:N&O:8:1.** Demonstrates conceptual understanding of rational numbers with respect to absolute values, perfect square and cube roots, and percents as a way of describing change (percent increase and decrease) using explanations, models, or other representations.

**M:N&O:8:2.** Demonstrates understanding of the relative magnitude of numbers by ordering or comparing rational numbers, common irrational numbers (e.g.,  $\sqrt{2}$ ,  $\pi$ ), numbers with whole number or fractional bases and whole number exponents, square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.

**M:N&O:8:3.** [No standard at this grade]

**M:N&O:8:4.** Accurately solves problems involving proportional reasoning (percent increase or decrease, interest rates, markups, or rates); multiplication or division of integers; and squares, cubes, and taking square or cube roots.

**M:N&O:8:5.** [No standard at this grade]

**M:N&O:8:6.** Uses a variety of mental computation strategies to solve problems (e.g., using compatible numbers, applying properties of operations, using mental imagery, using patterns) and to determine the reasonableness of answers; mentally calculates benchmark perfect squares and related square roots (e.g.,  $1^2$ ,  $2^2$ , ...,  $12^2$ ,  $15^2$ ,  $20^2$ ,  $25^2$ ,  $100^2$ ,  $1000^2$ ); determines the part of a number using benchmark percents and related fractions (1%, 10%, 25%,  $33\frac{1}{3}\%$ , 50%,  $66\frac{2}{3}\%$ , 75%, and 100%)

(e.g., 25% of 16;  $33\frac{1}{3}\%$  of 330).

**M:N&O:8:7.** Makes estimates in a given situation (including tips, discounts, tax, and the value of a non-perfect square root as between two whole numbers) by identifying when estimation is appropriate, selecting the appropriate method of estimation; determining the level of accuracy needed given the situation; analyzing the effect of the estimation method on the accuracy of results; and evaluating the reasonableness of solutions appropriate to grade level GLEs across content strands.

**M:N&O:8:8.** Applies properties of numbers (odd, even, remainders, divisibility, and prime factorization) and field properties (commutative, associative, identity [including the multiplicative property of one, e.g.,  $2^0 \times 2^3 = 2^{0+3} = 2^3$ , so  $2^0 = 1$ ], distributive, inverses) to solve problems and to simplify computations, and demonstrates conceptual understanding of field properties as they apply to subsets of real numbers when addition and multiplication are not defined in the traditional ways (e.g., If  $a \Delta b = a + b - 1$ , is  $\Delta$  a commutative operation?)

#### Geometry and Measurement

**M:G&M:8:1.** Uses properties of angle relationships resulting from two or three intersecting lines (adjacent angles, vertical angles, straight angles, or angle relationships formed by two non-parallel lines cut by a transversal), or two parallel lines cut by a transversal to solve problems.

**M:G&M:8:2.** Applies the Pythagorean Theorem to find a missing side of a right triangle, or in problem solving situations.

**M:G&M:8:3.** [No standard at this grade]

**M:G&M:8:4.** [No standard at this grade]

**M:G&M:8:5.** Applies concepts of similarity to determine the impact of scaling on the volume or surface area of three-dimensional figures when linear dimensions are multiplied by a constant factor; to determine the length of sides of similar triangles, or to solve problems involving growth and rate.

**M:G&M:8:6.** Demonstrates conceptual understanding of surface area or volume by solving problems involving surface area and volume of rectangular prisms, triangular prisms, cylinders, pyramids, or cones. Expresses all measures using appropriate units.

**M:G&M:8:7.** [No standard at this grade]

**M:G&M:8:8.** [No standard at this grade]

**M:G&M:8:9.** [No standard at this grade]

**M:G&M:8:10.** [No standard at this grade]

#### Functions and Algebra

**M:F&A:8:1.** Identifies and extends to specific cases a variety of patterns (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; and generalizes a linear relationship (nonrecursive explicit equation); generalizes a linear relationship to find a specific case; generalizes a nonlinear relationship using words or symbols; or generalizes a common nonlinear relationship to find a specific case.

**M:F&A:8:2.** Demonstrates conceptual understanding of linear relationships ( $y = kx$ ;  $y = mx + b$ ) as a constant rate of change by solving problems involving the relationship between slope and rate of change; informally and formally determining slopes and intercepts represented in graphs, tables, or problem situations; or describing the meaning of slope and intercept in context; and distinguishes between linear relationships (constant rates of change) and nonlinear relationships (varying rates of change) represented in tables, graphs, equations, or problem situations; or describes how change in the value of one variable relates to change in the value of a second variable in problem situations with constant and varying rates of change.

**M:F&A:8:3.** Demonstrates conceptual understanding of algebraic expressions by evaluating and simplifying algebraic expressions (including those with square roots, whole number exponents, or rational numbers); or by evaluating an expression within an equation (e.g., determine the value of  $y$  when  $x = 4$  given  $y = 7\sqrt{x} + 2x$ ).

**M:F&A:8:4.** Demonstrates conceptual understanding of equality by showing equivalence between two expressions (expressions consistent with the parameters of the left- and right-hand sides of the equations being solved at this grade level) using models or different representations of the expressions, solving formulas for a variable requiring one transformation (e.g.,  $d = rt$ ;  $d/r = t$ ); by solving multi-step linear equations with integer coefficients; by showing that two expressions are or are not equivalent by applying commutative, associative, or distributive properties, order of operations, or substitution; and by informally solving problems involving systems of linear equations in a context.

### Data, Statistics, and Probability

**M:DSP:8:1.** Interprets a given representation (line graphs, scatter plots, histograms, or box and-whisker plots) to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems.

**M:DSP:8:2.** Analyzes patterns, trends, or distributions in data in a variety of contexts by determining or using measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, quartile values, or estimated line of best fit to analyze situations, or to solve problems; and evaluates the sample from which the statistics were developed (bias, random, or non-random).

**M:DSP:8:3.** Organizes and displays data using scatter plots to answer questions related to the data, to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems; or identifies representations or elements of representations that best display a given set of data or situation, consistent with the representations required in M:DSP:8:1.

**M:DSP:8:4.** Uses counting techniques to solve problems in context involving combinations or permutations using a variety of strategies (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or others).

**M:DSP:8:5.** For a probability event in which the sample space may or may not contain equally likely outcomes, determines the experimental or theoretical probability of an event in a problem-solving situation; and predicts the theoretical probability of an event and tests the prediction through experiments and simulations; compares and contrasts theoretical and experimental probabilities; finds the odds of an event and understands the relationship between probability and odds.

**M:DSP:8:6.** In response to a teacher or student generated question or hypothesis decides the most effective method (e.g., survey, observation, experimentation) to collect the data (numerical or categorical) necessary to answer the question; collects, organizes, and appropriately displays the data; analyzes the data to draw conclusions about the question or hypothesis being tested while considering the limitations that could affect interpretations; and when

appropriate makes predictions; and asks new questions and makes connections to real-world situations.

### Problem Solving, Reasoning, and Proof

**M:PRP:8:1.** Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content and be able to:

- Use problem-solving strategies appropriately and effectively for a given situation.
- Determine, collect and organize the relevant information needed to solve real-world problems.
- Apply integrated problem-solving strategies to solve problems in the physical, natural and social sciences, and in pure mathematics.
- Use technology when appropriate to solve problems.
- Reflect on solutions and the problem-solving process for a given situation and refine strategies as needed.

**M:PRP:8:2.** Students will use mathematical reasoning and proof and be able to:

- Draw logical conclusions and make generalizations using deductive and inductive reasoning.
- Formulate, test, and justify mathematical conjectures and arguments.
- Construct and determine the validity of a mathematical argument or a solution.
- Apply mathematical reasoning skills in other disciplines.

### Communication, Connections, and Representations

**M:CCR:8:1.** Students will communicate their understanding of mathematics and be able to:

- Articulate ideas clearly and logically in both written and oral form.
- Present, share, explain, and justify thinking with others and build upon the ideas of others to solve problems.
- Use mathematical symbols and notation.
- Formulate questions, conjectures, definitions, and generalizations about data, information, and problem situations.

**M:CCR:8:2.** Students will create and use representations to communicate mathematical ideas and to solve problems and be able to:

- Use models and technology to develop equivalent representations of the same mathematical concept.
- Use and create representations to solve problems and organize their thoughts and ideas.
- Convert between representations (e.g., a table of values, an equation, and a graph may all be representations of the same function).

**M:CCR:8:3.** Students will recognize, explore, and develop mathematical connections and be able to:

- Connect new mathematical ideas to those already studied and build upon them.
- Understand that many real-world applications require an understanding of mathematical concepts (e.g.,



personal finance, running a business, building a house, following a recipe, or sending a rocket to the moon).

- Explain in oral and written form the relationships between a real-world problem and an appropriate mathematical model.

- Explain in oral and written form the relationships among various mathematical concepts (e.g., the relationship between exponentiation and multiplication).

**NEW HAMPSHIRE High School Mathematics**  
Curriculum Frameworks

Number and Operations

**M:N&O:HS:1.** Demonstrates conceptual understanding of rational numbers by knowing why a real number is rational if and only if the number's decimal expansion eventually repeats or terminates.

**M:N&O:HS:2.** Demonstrates understanding of the relative magnitude of real numbers by solving problems that involve ordering or comparing elements of any subset of the real numbers.

**M:N&O:10:2.** Demonstrates understanding of the relative magnitude of real numbers by solving problems involving ordering or comparing rational numbers, common irrational numbers (e.g.,  $\sqrt{2}$ ,  $\pi$ ), rational bases with integer exponents, square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.

**M:N&O:HS:3.** [No standard at this level]

**M:N&O:HS:4.** Accurately solves problems.

- Interprets and computes with rational exponents and their relation to radicals, by hand in simple cases (e.g.,  $4^{3/2}$ ), and using a calculator when appropriate.
- Interprets and computes in scientific notation with and without a calculator.

- Solves compound interest problems using

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \text{ where } n \text{ is finite}$$

**M:N&O:10:4.** Accurately solves problems involving rational numbers within mathematics, across content strands, disciplines or contexts (with emphasis on, but not limited to, proportions, percents, ratios, and rates).

**M:N&O:HS:5.** [No standard at this level]

**M:N&O:HS:6.** Uses a variety of mental computation strategies to solve problems (e.g., using compatible numbers, applying properties of operations, using mental imagery, using patterns) and to determine the reasonableness of answers.

**M:N&O:HS:7.** Makes estimates in a given situation (e.g., tips, discounts, tax, the value of a non-perfect square root or cube root) by identifying when estimation is appropriate, selecting the appropriate method of estimation; determining the level of accuracy needed given the situation; analyzing the effect of the estimation method on the accuracy of results; evaluating the reasonableness of solutions appropriate to GSEs across content strands.

**M:N&O:HS:8.** Applies properties of numbers and field properties (including determining whether a given subset of numbers is closed under a given arithmetic operation) to solve problems or to simplify computations; and compares and contrasts the properties of numbers and number systems; adds and multiplies numerical matrices with attention to the arithmetic properties of these operations.

Geometry and Measurement

**M:G&M:HS:1.** [No standard at this level]

**M:G&M:HS:2.** Creates formal proofs of propositions (e.g., angles, lines, circles, distance, midpoint and polygons including triangle congruence and similarity).

**M:G&M:10:2.** Makes and defends conjectures, constructs geometric arguments, uses geometric properties, or uses theorems to solve problems involving angles, lines, polygons, circles, or right triangle ratios (sine, cosine, tangent) within mathematics or across disciplines or contexts (e.g., Pythagorean Theorem, Triangle Inequality Theorem).

**M:G&M:HS:3.** [No standard at this level]

**M:G&M:HS:4.** Applies the concepts of congruency by using matrices to represent reflections, translations, and rotations.

**M:G&M:10:4.** Applies the concepts of congruency by solving problems on or off a coordinate plane involving reflections, translations, or rotations; or solves problems using congruency involving problems within mathematics or across disciplines or contexts.

**M:G&M:HS:5.** Applies concepts of similarity to define the trigonometric functions as ratios of sides of right triangles; uses the ratios of the sides of special right triangles ( $30^\circ$ - $60^\circ$ - $90^\circ$  and  $45^\circ$ - $45^\circ$ - $90^\circ$ ) to determine the sine, cosine and tangent of  $30^\circ$ ,  $45^\circ$ , and  $60^\circ$ ; and solves related problems.

**M:G&M:10:5.** Applies concepts of similarity by solving problems within mathematics or across disciplines or contexts.

**M:G&M:HS:6.** Applies trigonometric formulas (e.g., Law of Sines, Law of Cosines,  $A = \frac{1}{2} ab \sin C$ ) to find angles, lengths and areas of polygons.

**M:G&M:10:6.** Solves problems involving perimeter, circumference, or area of two-dimensional figures (including composite figures) or surface area or volume of three-dimensional figures (including composite figures) within mathematics or across disciplines or contexts.

**M:G&M:HS:7.** Applies informal concepts of successive approximation, upper and lower bounds, and limits in measurement situations (e.g., use successive approximation to find the area of a pond); and uses measurement conversion strategies (e.g., unit/dimensional analysis).

**M:G&M:10:7.** Uses units of measure appropriately and consistently when solving problems across content strands; makes conversions within or across systems and makes decisions concerning an appropriate degree of accuracy in problem situations involving measurement in other GSEs.

**M:G&M:HS:8.** [No standard at this level]

**M:G&M:10:9.** Solves problems on and off the coordinate plane involving distance, midpoint, perpendicular and parallel lines, or slope.

**M:G&M:HS:10.** Demonstrates conceptual understanding of spatial reasoning and visualization by sketching or using dynamic geometric software to generate three-dimensional objects from two-dimensional perspectives, or to generate two-dimensional perspectives from three-dimensional objects, and by solving related problems; perform and justify constructions with a compass and straightedge or dynamic geometric software.

## Functions and Algebra

**M:F&A:HS:1.** Identifies arithmetic and geometric sequences and finds the  $n$ th term; then uses the generalization to find a specific term.

**M:F&A:10:1.** Identifies, extends, and generalizes a variety of patterns (linear and nonlinear) represented by models, tables, sequences, or graphs in problem solving situations.

**M:F&A:HS:2.** Demonstrates conceptual understanding of linear and nonlinear functions and relations.

- Analyzes characteristics of classes of functions (polynomial, rational, and exponential) to include domain, range, intercepts, increasing and decreasing intervals and rates of change.
- Understands one-to-one (injective) functions and that a function that is one-to-one has a converse that is also a function; and finds inverses algebraically and graphically.
- Graphs polynomial, rational and exponential functions, including vertical and horizontal shifts, stretches, and compressions as well as reflections across vertical and horizontal axes.
- Applies knowledge of functions to interpret and understand situations, design mathematical models, and solve problems in mathematics as well as in the natural and social sciences.

**M:F&A:10:2.** Demonstrates conceptual understanding of linear and nonlinear functions and relations (including characteristics of classes of functions) through an analysis of constant, variable, or average rates of change, intercepts, domain, range, maximum and minimum values, increasing and decreasing intervals and rates of change (e.g., the height is increasing at a decreasing rate); describes how change in the value of one variable relates to change in the value of a second variable; or works between and among different representations of functions and relations (e.g., graphs, tables, equations, function notation).

**M:F&A:HS:3.** Demonstrates conceptual understanding of algebraic expressions.

- Manipulates, evaluates, and simplifies algebraic and numerical expressions.
- Adds, subtracts, multiplies and divides polynomials and rational expressions.
- Factors quadratic and higher degree polynomials.

- Understands properties of logarithms and converts between logarithmic and exponential forms.
- Manipulates, evaluates, and simplifies expressions involving rational exponents and radicals and converts between expressions with rational exponents and expressions with radicals.
- Understands the effect of simplifying rational expressions on the domain of the related functions (e.g.,  $x^2/x = x$  for  $x \neq 0$ ).

**M:F&A:10:3.** Demonstrates conceptual understanding of algebraic expressions by solving problems involving algebraic expressions, by simplifying expressions (e.g., simplifying polynomial or rational expressions, or expressions involving integer exponents, square roots, or absolute values), by evaluating expressions, or by translating problem situations into algebraic expressions.

**M:F&A:HS:4.** Demonstrates conceptual understanding of equality.

- Factors, completes the square, uses the quadratic formula, and graphs quadratic functions to solve quadratic equations.
- Solves equations involving polynomial, rational, and radical expressions. Graphs and interprets the solutions.
- Understands extraneous solutions.
- Finds approximate solutions to equations by graphing each side as a function using technology. Understands that any equation in  $x$  can be interpreted as the equation  $f(x) = g(x)$  and interpret the solutions of the equation as the  $x$ -value(s) of the intersection point(s) of the graphs of  $y = f(x)$  and  $y = g(x)$ .
- Solves  $2 \times 2$  and  $3 \times 3$  systems of linear equations and graphically interprets the solutions.
- Solves systems of linear and quadratic inequalities.
- Solves systems of equations involving nonlinear expressions and graphically interprets the solutions.
- Translates problem situations into inequalities; and solves linear and non-linear inequalities (symbolically and graphically).

**M:F&A:10:4.** Demonstrates conceptual understanding of equality by solving problems involving algebraic reasoning about equality; by translating problem situations into equations; by solving linear equations (symbolically and graphically) and expressing the solution set symbolically or graphically, or provides the meaning of the graphical interpretations of solution(s) in problem-solving situations; or by solving problems involving systems of linear equations in a context (using equations or graphs) or using models or representations.

## Data, Statistics, and Probability

**M:DSP:HS:1.** Interprets a given representation(s) (e.g., regression function including linear, quadratic, and exponential) to analyze the data to make inferences and to formulate, justify, and critique conclusions.

**M:DSP:10:1.** Interprets a given representation(s) (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts) to make observations, to answer questions, to analyze the data to formulate or justify conclusions, critique conclusions, make predictions, or to solve problems within mathematics or across disciplines or contexts (e.g., media, workplace, social and environmental situations).

**M:DSP:HS:2.** Analyzes patterns, trends, or distributions in data in a variety of contexts by determining or using measures of dispersion (standard deviation, variance, and percentiles).

**M:DSP:10:2.** Analyzes patterns, trends, or distributions in data in a variety of contexts by determining, using, or analyzing measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, quartile values, estimated line of best fit, regression line, or correlation (strong positive, strong negative, or no correlation) to solve problems; and solve problems involving conceptual understanding of the sample from which the statistics were developed.

**M:DSP:HS:3.** Organizes and displays one and two-variable data using a variety of representations (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts, linear, quadratic, and exponential regression functions) to analyze the data to formulate or justify conclusions, make predictions, or to solve problems with or without using technology.

**M:DSP:10:3.** Identifies or describes representations or elements of representations that best display a given set of data or situation, consistent with the representations required in M:DSP:10:1.

**M:DSP:HS:4.** Uses counting techniques to solve problems in context involving combination or permutations using a variety of strategies (e.g.,  $nCr$ ,  $nPr$ , or  $n!$ ); and finds unions, intersections, and complements of sets.

**M:DSP:10:4.** Uses counting techniques to solve problems in context involving combinations or permutations using a variety of strategies (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or others).

**M:DSP:HS:5.** For a probability event in which the sample space may or may not contain equally likely outcomes, predicts the theoretical probability of an event and tests the prediction through experiments and simulations; compares and contrasts theoretical and experimental probabilities; finds the odds of an event and understands the relationship between probability and odds.

**M:DSP:10:5.** Solves problems involving experimental or theoretical probability.

**M:DSP:HS:6.** In response to a teacher or student generated question or hypothesis decides the most effective method (e.g., survey, observation, research, experimentation) and sampling techniques (e.g., random sample, stratified random sample) to collect the data necessary to answer the question; collects, organizes, and

appropriately displays the data; analyzes the data to draw conclusions about the questions or hypotheses being tested while considering the limitations of the data that could effect interpretations; and when appropriate makes predications, asks new questions, or makes connections to real-world situations.

### Problem Solving, Reasoning, and Proof

**M:PRP:HS:1.** Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content and be able to:

- Expand the repertoire of problem-solving strategies and use those strategies in more sophisticated ways.
- Use technology whenever appropriate to solve real-world problems (e.g., personal finance, wages, banking and credit, home improvement problems, measurement, taxes, business situations, purchasing, and transportation).
- Formulate and redefine problem situations as needed to arrive at appropriate conclusions.

**M:PRP:HS:2.** Students will use mathematical reasoning and proof and be able to:

- Expand the repertoire of proof techniques and use those techniques in more sophisticated ways.
- Use informal and formal reasoning and proof to explain and justify conclusions.
- Formalize mathematical arguments through the use of deductive reasoning.
- Use the principle of mathematical induction.
- Use reasoning and proof throughout classroom discussions independent of the mathematical topic being studied.
- Recognize how reasoning and proof influence the structure of mathematics.

### Communication, Connections, and Representations

**M:CCR:HS:1.** Students will communicate their understanding of mathematics and be able to:

- Explain and justify their thinking and develop increasingly sophisticated questions for given problem-situations.
- Critique and follow the logic of arguments presented within mathematics and across disciplines.

**M:CCR:HS:2.** Students will create and use representations to communicate mathematical ideas and to solve problems and be able to:

- Choose appropriate representations and mathematical language (e.g., spreadsheets, geometric models, algebraic symbols, tables, graphs, matrices) to present ideas clearly and logically for a given situation.
- See a common structure in mathematical phenomena that come from very different contexts (e.g., the sum of the first  $n$  odd natural numbers, the areas of square gardens, and the distance traveled by a vehicle that starts at rest and accelerates at a constant rate can be represented by functions of the form  $f(x) = ax^2$ ).

- Find representations that model essential features of a mathematical situation (e.g., cost of postage can be modeled by a step-function).
- Use representations as a primary means for expressing and understanding more abstract mathematical concepts.

**M:CCR:HS:3.** Students will recognize, explore, and develop mathematical connections and be able to:

- Explain in oral or written form how mathematics connects to other disciplines, to daily life, careers, and society (e.g., geometry in art and literature, data analysis in social studies, and exponential growth in finance).
- Explain multiple approaches that lead to equivalent results when solving problems.

# NEW HAMPSHIRE Advanced Mathematics Curriculum Frameworks

## Number and Operations

**M:N&O:AM:1.** Demonstrates conceptual understanding of the real number system as an extension of the rational numbers by representing real numbers as infinite decimal expansions (that provide successive rational approximations to the number) and as points on a number line. Determines whether the decimal expansion of a rational number given in fractional form eventually repeats or terminates (without using a calculator).

**M:N&O:AM:2.** [No standard at this level]

**M:N&O:AM:3.** [No standard at this level]

**M:N&O:AM:4.** Accurately solves problems.

- Solves problems involving scientific notation and assesses the precision of the answer in terms of significant digits.
- Solves problems involving complex numbers by adding, multiplying, dividing, and computing conjugates; interprets complex numbers geometrically; and understands complex numbers as an extension of the real numbers (e.g., arising in solutions of polynomial equations).
- Manipulates complex numbers using rectangular and polar coordinates.
- Finds the  $n$ th roots of a complex number using De Moivre's Theorem.
- Solves compound interest problems including continuously compounded interest.

**M:N&O:AM:5.** [No standard at this level]

**M:N&O:AM:6.** [No standard at this level]

**M:N&O:AM:7.** [No standard at this level]

**M:N&O:AM:8.** Explores field properties with vectors and matrices; algebraically/geometrically interpret vectors, vector addition, and scalar multiplication in the plane; and solves problems using matrices (e.g., inverses, identity, determinants, and augmented matrices).

## Geometry and Measurement

**M:G&M:AM:1.** [No standard at this level]

**M:G&M:AM:2.** Extends and deepens knowledge and usage of proofs and proof techniques; and uses geometric models to represent and distinguish between Euclidean and Non-Euclidean Systems.

**M:G&M:AM:3.** [No standard at this level]

**M:G&M:AM:4.** [No standard at this level]

**M:G&M:AM:5.** [No standard at this level]

**M:G&M:AM:6.** Derives and uses formulas for lengths of arcs and areas of sectors and areas of segments of circles.

**M:G&M:AM:7.** Uses radian measure appropriately when solving problems; converts between radian measure and degree measure; and understands why radian measure is useful.

**M:G&M:AM:8.** [No standard at this level]

**M:G&M:AM:9.** Solves problems using analytic geometry (including three dimensions) and circular trigonometry (e.g., find the equation of a circle inscribed in a triangle; find the distance between opposite vertices in a rectangular solid); explores and interprets the characteristics of conic sections graphically and algebraically including understanding how different planar slices of a double cone yield different conic sections; knows the characterization of conic sections as loci of points in the plane satisfying certain distance requirements, and uses the distance formula to obtain equations for the conic sections.

**M:G&M:AM:10.** [No standard at this level]

## Functions and Algebra

**M:F&A:AM:1.** Computes partial sums of infinite arithmetic and geometric sequences, determines when an infinite geometric series converges, and finds its sum. Connects arithmetic and geometric sequences to linear and exponential functions, respectively. Works between recursive and explicit representations.

**M:F&A:AM:2.** Demonstrates conceptual understanding of linear and nonlinear functions and relations.

- Understands functions and relations from a set-theoretic perspective, and operations on functions including composition.
- Analyzes characteristics of classes of functions and inverse functions (exponential, logarithmic, trigonometric) to include domain, range, intercepts, increasing and decreasing intervals and rates of change, periodicity, end behavior, maximum and minimum values, continuity, and asymptotes; graphs classes of functions; and understands domain restrictions and their effects on functions.
- Analyzes properties of functions including onto (surjectivity), critical points and inflection points. Determine graphically and analytically whether a function is even, odd or neither.
- Analyzes informally the idea of continuity and limits.

**M:F&A:AM:3.** Demonstrates conceptual understanding of algebraic expressions.

- Simplifies complex fractions.
- Uses the Remainder Theorem, the Factor Theorem and Rational Root Theorem for polynomials.
- Knows the Fundamental Theorem of Algebra and that non-constant polynomials always factor into linear factors over the complex numbers.
- Understands the difference between factoring polynomials over integer, rational, real, and complex numbers.

**M:F&A:AM:4.** Demonstrates conceptual understanding of equality.

- Solves equations and verifies/proves identities involving trigonometric expressions.
- Solves equations involving exponential and logarithmic expressions; graphs and interprets the solutions.

- Uses matrices or determinants to solve systems of equations with or without technology.
- Knows and applies the Intermediate Value Theorem to find exact or approximate solutions of equations or zeros of continuous functions.

#### Data, Statistics, and Probability

**M:DSP:AM:1.** [No standard at this level]

**M:DSP:AM:2.** Analyzes and interprets measures of dispersion (standard deviation, variance, and percentiles) and central tendency for the normal distribution; and

interprets the correlation coefficient and the coefficient of determination in the context of data.

**M:DSP:AM:3.** Uses technology to explore the method of least squares and median-median for linear regression.

**M:DSP:AM:4.** [No standard at this level]

**M:DSP:AM:5.** Solves probability problems (e.g., by applying concepts of counting, random variables, independence/dependence of events, and conditional probability).

**M:DSP:AM:6.** [No standard at this level]

Science

**NEW HAMPSHIRE Grades 9–11 Earth Space Science Curriculum Frameworks**

**NEW HAMPSHIRE Grades 9–11 Earth Space Science Curriculum Frameworks**

**ESS1.** The Earth and Earth materials, as we know them today, have developed over long periods of time, through constant change processes.

**1. ATMOSPHERE, CLIMATE, & WEATHER**

**S(ESS1)-11-1.1.** Explain how winds and ocean currents are created on the Earth's surface.

**S(ESS1)-11-1.2.** Explain how heat and energy transfer in and out of the atmosphere, and provide examples of how it is related to weather and climate.

**S(ESS1)-11-1.3.** Describe how Earth's atmospheric composition has changed from the formation of the Earth through current time.

**S(ESS1)-11-1.4.** Explain how Earth's features can affect wind and weather patterns by causing air to rise and increasing precipitation.

**2. COMPOSITION & FEATURES**

**S(ESS1)-11-2.1.** Recognize that elements exist in fixed amounts and describe how they move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles, such as the water, carbon and nitrogen cycles.

**S(ESS1)-11-2.2.** Describe the conditions that enable the Earth to support life, such as the availability of water, the gravitational force, the EM field and the intensity of radiation from the Sun.

**S(ESS1)-11-2.3.** Explain the theory of plate tectonics.

**S(ESS1)-11-2.4.** Describe the movement of crustal plates and explain how the effects have altered the Earth's features.

**3. FOSSILS & GEOLOGIC TIME**

**S(ESS1)-11-3.1.** Identify and describe the methods used to measure geologic time, such as fossil identification, radioactive dating, and rock sequences.

**S(ESS1)-11-3.2.** Relate how geologic time is determined using various dating methods (e.g., radioactive, decay, rock sequences, fossil records).

**4. OBSERVATION OF EARTH FROM SPACE**

**S(ESS1)-11-4.1.** Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an earth event (e.g. volcanoes mountain ranges, islands, earthquakes, tides, tsunamis).

**5. PROCESSES & RATES OF CHANGE**

**S(ESS1)-11-5.1.** Explain that the Earth is composed of interactive layers, which have distinct compositions, physical properties and processes.

**S(ESS1)-11-5.2.** Relate plate movement to earthquakes and volcanic activity, and explain how it results in tectonic uplift and mountain building.

**S(ESS1)-11-5.3.** Identify and describe the major external and internal sources of energy on Earth.

**S(ESS1)-11-5.4.** Provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics.

**S(ESS1)-11-5.5.** Trace the development of the theory of plate tectonics.

**S(ESS1)-11-5.6.** Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).

**6. ROCK CYCLE**

**S(ESS1)-11-6.1.** Explain that throughout the rock cycle, the total amount of the material remains the same.

**7. WATER**

**S(ESS1)-11-7.1.** Explain that water quality can be affected positively or negatively by outside sources.

**ESS2.** The Earth is part of a solar system, made up of distinct parts, which have temporal and spatial interrelationships.

**1. EARTH SUN MOON**

**S(ESS2)-11-1.1.** Explain how the Earth, Moon and Sun were formed.

**2. ENERGY**

**S(ESS2)-11-2.1.** Identify the Earth's major external source of energy as solar energy.

**S(ESS2)-11-2.2.** Explain how the inclination of incoming solar radiation can impact the amount of energy Earth receives on any given surface area.

**S(ESS2)-11-2.3.** Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle (plate tectonics, sea floor spreading).

**3. SOLAR SYSTEM**

**S(ESS2)-11-3.1.** Explain how gravitational force influenced the formations of the planets and their moons, and describe how these objects move in patterns under its continued influence.

**S(ESS2)-11-3.2.** Explain how the Solar System formed from a giant cloud of gas and debris about 5 billion years ago.

**4. VIEW FROM EARTH**

*None at this grade span.*



**ESS3.** The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time.

**1. SIZE AND SCALE**

**S(ESS3)-11-1.1.** Recognize electromagnetic waves can be used to locate objects in the universe, and track their movement.

**S(ESS3)-11-1.2.** Define a light year.

**2. STARS AND GALAXIES**

**S(ESS3)-11-2.1.** Identify and describe the characteristics common to most stars in the universe.

**S(ESS3)-11-2.2.** Describe the ongoing processes involved in star formation, their life cycles and their destruction.

**S(ESS3)-11-2.3.** Explain the relationships between or among the energy produced from nuclear reactions, the origin of elements, and the life cycles of stars.

**3. UNIVERSE**

**S(ESS3)-11-3.1.** Explain that current scientific evidence supports the Big Bang Theory as a probable explanation of the origin of the universe, and describe the theory.

**S(ESS3)-11-3.2.** Explain the evidence that suggests the universe is expanding.

**S(ESS3)-11-3.3.** Provide scientific evidence that supports or refutes the “Big Bang” theory of how the universe was formed.

**S(ESS3)-11-3.4.** Based on the nature of electromagnetic waves, explain the movement and location of objects in the universe or their composition (e.g., red shift, blue shift, line spectra).

**S(ESS3)-11-3.5.** Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes; visual, radio and x-ray telescopes).

**ESS4.** The growth of scientific knowledge in Earth Space Science has been advanced through the development of technology and is used (alone or in combination with other

sciences) to identify, understand and solve local and global issues.

**1. DESIGN TECHNOLOGY**

**S(ESS4)-11-1.1.** Describe ways in which technology has increased our understanding of the universe.

**S(ESS4)-11-1.2.** Understand that technology is designed with a particular function in mind, and principles of Earth Space science are useful in creating technology for the Earth space sciences.

**2. TOOLS**

**S(ESS4)-11-2.1.** Describe the use and benefits of Land based Light Telescopes, radio telescopes, spectrophotometers, satellites, manned exploration, probes, and robots to the study of Earth Space Science.

**S(ESS4)-11-2.2.** Explain how scientists study the Earth using computer-generated models and observations from both land based sites and satellites, and describe the value of using these tools in unison.

**3. SOCIAL ISSUES (LOCAL AND GLOBAL)**

**USES OF EARTH MATERIALS**

**S(ESS4)-11-3.1.** Differentiate between and provide examples of renewable and nonrenewable sources of energy, and explain the advantages and limitations of each.

**S(ESS4)-11-3.2.** Describe the means for transforming a natural material, such as iron ore, into useful products during different historical periods, such as the Stone Age, Iron Age, Renaissance, the Industrial Period and the current Age of Information.

**ENVIRONMENTAL CHANGE**

**S(ESS4)-11-3.3.** Explain how the use of technologies at a local level, such as burning of fossil fuels for transportation or power generation, may contribute to global environmental problems.

**4. CAREER TECHNICAL EDUCATION CONNECTIONS**

**S(ESS4)-11-4.1.** Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to Earth or space sciences.

# NEW HAMPSHIRE Grades 11–12 Earth Space Science Curriculum Frameworks

## NEW HAMPSHIRE Grades 11–12 Earth Space Science Curriculum Frameworks

**ESS1.** The Earth and Earth materials, as we know them today, have developed over long periods of time, through constant change processes.

### 1. ATMOSPHERE, CLIMATE, & WEATHER

**S(ESS1)-12-1.1.** Identify and describe the layers of the atmosphere.

**S(ESS1)-12-1.2.** Understand the effects of solar influences, such as flares and sunspots, on atmospheric conditions.

### 2. COMPOSITION & FEATURES

*None at this grade span.*

### 3. FOSSILS & GEOLOGIC TIME

*None at this grade span.*

### 4. OBSERVATION OF EARTH FROM SPACE

*None at this grade span.*

### 5. PROCESSES & RATES OF CHANGE

*None at this grade span.*

### 6. ROCK CYCLE

**S(ESS1)-12-6.1.** Describe the processes that transform one type of rock into another, such as lithification, metamorphosis, and weathering on a chemical level.

**S(ESS1)-12-6.2.** Describe the various types of igneous, sedimentary, and metamorphic rocks found on Earth.

### 7. WATER

*None at this grade span.*

**ESS2.** The Earth is part of a solar system, made up of distinct parts, which have temporal and spatial interrelationships.

### 1. EARTH SUN MOON

**S(ESS2)-12-1.1.** Understand how the Nebular Hypothesis, fusion, and the process of differentiation contributes to the structure and organization of the universe.

### 2. ENERGY

*None at this grade span.*

### 3. SOLAR SYSTEM

*None at this grade span.*

### 4. VIEW FROM EARTH

*None at this grade span.*

**ESS3.** The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time.

### 1. SIZE AND SCALE

*None at this grade span.*

### 2. STARS AND GALAXIES

*None at this grade span.*

### 3. UNIVERSE

*None at this grade span.*

**ESS4.** The growth of scientific knowledge in Earth Space Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

### 1. DESIGN TECHNOLOGY

**S(ESS4)-12-1.1.** Recognize the importance of technology as it relates to science, for purposes such as: access to space and other remote locations, sample collection and treatment, measurement, data collection, and storage, computation, and communication of information.

### 2. TOOLS

*None at this grade span.*

### 3. SOCIAL ISSUES (LOCAL AND GLOBAL)

#### USES OF EARTH MATERIALS

**S(ESS4)-12-3.1.** Explain the environmental effects of using both renewable and nonrenewable resources and provide examples of how man is addressing these effects on the environment

**S(ESS4)-12-3.2.** Provide examples of how man's use of Earth materials has changed over time, and use those examples to explain how the relationship between science and technology has gradually grown closer in the past century.

#### ENVIRONMENTAL CHANGE

**S(ESS4)-12-3.3.** Research and evaluate a current environmental issue within the State of New Hampshire, such as a dispute regarding the conversion of a natural environment to human use, and construct a defense that supports environmental protection.

### 4. CAREER TECHNICAL EDUCATION CONNECTIONS

**S(ESS4)-12-4.1.** Understand the various scientific fields that use scientific content and skills and distinguish between professional and skilled science jobs/careers in Earth or space sciences.

NEW HAMPSHIRE Grades 9–11 Life Science  
Curriculum Frameworks

NEW HAMPSHIRE Grade 9–11 Life Science  
Curriculum Frameworks

**LS1.** All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).

**1. CLASSIFICATION**

**S(LS1)-11-1.1.** Describe how organisms are classified into a hierarchy of groups and subgroups, which are based on similarities that reflect their evolutionary relationships.

**S(LS1)-11-1.2.** Explain that organisms that possess similar DNA code are more closely related than those in which DNA varies greatly.

**S(LS1)-11-1.3.** Identify plants and animals according to binomial nomenclature.

**S(LS1)-11-1.4.** Differentiate between prokaryotic and eukaryotic cells according to general structure and degrees of complexity.

**2. LIVING THINGS & ORGANIZATION**

**S(LS1)-11-2.1.** Identify the structures of different types of cell parts/organelles and explain the functions they perform.

**S(LS1)-11-2.2.** Recognize how cell functions are regulated through changes in the activity of the functions performed by proteins, and through the selective expression of individual genes; and explain how this regulation allows cells to respond to their environment and to control and coordinate cell growth and division.

**S(LS1)-11-2.3.** Recognize how an organism's organization and complexity accommodate its need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain it.

**S(LS1)-11-2.4.** Explain how the processes of photosynthesis and cellular respiration are interrelated and contribute to biogeochemical cycles.

**S(LS1)-11-2.5.** Describe the structures of proteins and their role in cell function.

**S(LS1)-11-2.6.** Describe the chemical reactions involved in cell functions using examples from the nervous, immune and endocrine systems in multicellular animals.

**S(LS1)-11-2.7.** Recognize that because all matter tends toward more disorganized states, living systems need a continuous input of energy to maintain their chemical and physical organizations.

**S(LS1)-11-2.8.** Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA transport, nerve cells).

**3. REPRODUCTION**

**S(LS1)-11-3.1.** Describe the chemical and structural properties of DNA and explain its role in identifying the characteristics of an organism.

**S(LS1)-11-3.2.** Recognize that new heritable characteristics can only result from new combinations of existing genes or from mutations of genes in an organism's sex cells, and explain why other changes in an organism cannot be passed on.

**S(LS1)-11-3.3.** Describe the alternation of generations, life cycles with haploid and diploid phases in living organisms, such as bacteria, plants and animals.

**S(LS1)-11-3.4.** Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations).

**LS2.** Energy flows and matter recycles through an ecosystem.

**1. ENVIRONMENT**

**S(LS2)-11-1.1.** Explain how the amount of life an environment can sustain is restricted by the availability of matter and energy, and the ability of the ecosystem to recycle materials.

**S(LS2)-11-1.2.** Describe how the interrelationships and interdependencies among organisms generate stable ecosystems that fluctuate around a state of rough equilibrium for hundreds or thousands of years.

**S(LS2)-11-1.3.** Identify the factors in an ecosystem that can affect its carrying capacity.

**S(LS2)-11-1.4.** Analyze and describe how environmental disturbances, such as climate changes, natural events, human activity and the introduction of invasive species, can affect the flow of energy or matter in an ecosystem.

**S(LS2)-11-1.5.** Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem.

**S(LS2)-11-1.6.** Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans.

**2. FLOW OF ENERGY & RECYCLING OF MATERIALS**

**S(LS2)-11-2.1.** Use examples from local ecosystems to describe the relationships among organisms at the different trophic levels.

**S(LS2)-11-2.2.** Explain that as matter and energy flow through different levels of organization in living systems and between living systems and the environment, elements, such as carbon and nitrogen, are recombined in different ways.

**S(LS2)-11-2.3.** Trace the cycling of matter (e.g., carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g., photosynthesis, cellular respiration, fermentation).

**LS3.** Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).

### 1. CHANGE

**S(LS3)-11-1.1.** Identify ways humans can impact and alter the stability of ecosystems, such as habitat destruction, pollution, and consumption of resources; and describe the potentially irreversible effects these changes can cause.

**S(LS3)-11-1.2.** Identify ways of detecting, and limiting or reversing environmental damage.

**S(LS3)-11-1.3.** Analyze the aspects of environmental protection, such as ecosystem protection, habitat management, species conservation and environmental agencies and regulations; and evaluate and justify the need for public policy in guiding the use and management of the environment.

### 2. EVIDENCE OF EVOLUTION

**S(LS3)-11-2.1.** Explain the currently accepted theory for the development of life on Earth, including the history of its origin and the evolutionary process.

**S(LS3)-11-2.2.** Recognize that the abilities and behaviors an organism has, and likelihood of its survival strongly depend on its heritable characteristics, which can be biochemical and anatomical.

**S(LS3)-11-2.3.** Explain the contributions of Darwin, Malthus, Wallace and Russell to the advancement of life science.

**S(LS3)-11-2.4.** Explain evolution in terms of how the Earth's present-day life forms evolved from earlier, distinctly different species as a consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection.

**S(LS3)-11-2.5.** Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis).

**S(LS3)-11-2.6.** Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population, OR explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment (e.g., giraffe, wind pollination of flowers).

### 3. NATURAL SELECTION

**S(LS3)-11-3.1.** Explain the concept of natural selection.

**S(LS3)-11-3.2.** Explain the diversity and unity of past and present life forms on Earth using currently accepted theories.

**S(LS3)-11-3.3.** Recognize how a species chance of survival increases with each variation of an organism within the species, and explain how, in the event of a major global change, the great diversity of species on Earth, the greater the chance for survival of life.

**S(LS3)-11-3.4.** Analyze present day data and research in areas, including antibiotic resistance in bacteria, changes in viral genomes, such as bird flu, DNA sequencing, and relate it to the concepts of natural selection.

**S(LS3)-11-3.5.** Identify and describe ways genes may be changed and combined to create genetic variation within a species.

**S(LS3)-11-3.6.** Explain that gene mutations and new combinations may have a variety of effects on the organism, including positive and negative ones, or none at all.

**S(LS3)-11-3.7.** Explain the concepts of Mendelian genetics.

**S(LS3)-11-3.8.** Use pedigree charts and Punnet Squares to determine patterns of inheritance.

**S(LS3)-11-3.9.** Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sach's disease).

**LS4.** Humans are similar to other species in many ways, and yet are unique among Earth's life forms.

### 1. BEHAVIOR

**S(LS4)-11-1.1.** Recognize that the immune system, endocrine system, and nervous system can affect the homeostasis of an organism.

**S(LS4)-11-1.2.** Describe how the functions of all the human body systems are interrelated at a chemical level and how they maintain homeostasis.

### 2. DISEASE

**S(LS4)-11-2.1.** Explain that disease in organisms can be caused by intrinsic failures of the system or infection by other organisms, and describe as well as provide examples of how some diseases are caused by: the breakdown in cellular function, congenital conditions, genetic disorders, malnutrition, and emotional health, including stress.

**S(LS4)-11-2.2.** Explain that vaccines were developed to reduce or eliminate diseases, and provide examples of how these medical advances have proven to be successful.

**S(LS4)-11-2.3.** Describe and provide examples of how new medical techniques, efficient health care delivery systems, improved sanitation, and a more complete understanding of the nature of disease provides today's humans a better chance of staying healthier than their forebears.

**S(LS4)-11-2.4.** Describe how some drugs mimic or block the molecules involved in transmitting nerve or hormone signals and explain how this disturbs the normal operations of the brain and body.

**S(LS4)-11-2.5.** Explain that gene mutation in a cell can result in uncontrolled division, which is called cancer and describe how exposure of cells to certain chemicals and radiation increase mutation, and thus the chance for cancer.

**S(LS4)-11-2.6.** Use evidence to make and support conclusions about the ways that humans or other organisms are affected by environmental factors or heredity (e.g., pathogens, diseases, medical advances, pollution, mutations).

### 3. HUMAN IDENTITY

**S(LS4)-11-3.1.** Describe how the length and quality of human life are influenced by many factors, including sanitation, diet, medical care, gender, genes, and environmental conditions and personal health behaviors.

**S(LS4)-11-3.2.** Explain how the immune system functions to prevent and fight disease.

**S(LS4)-11-3.3.** Explain how the immune system, endocrine system, or nervous system works and draw conclusions about how systems interact to maintain homeostasis in the human body.

**LS5.** The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

#### 1. DESIGN TECHNOLOGY

**S(LS5)-11-1.1.** Describe ways in which technology has increased our understanding of the life sciences.

**S(LS5)-11-1.2.** Understand that technology is designed with a particular function in mind, and principles of life

science are useful in creating technology for the life sciences.

#### 2. TOOLS

**S(LS5)-11-2.1.** Describe the use and benefits of equipment such as, light microscopes, transmission electron microscopes, scanning electron microscopes, spectrophotometers, probes, and robotics to the study of the life sciences.

#### 3. SOCIAL ISSUES (LOCAL AND GLOBAL) MEDICAL TECHNOLOGIES

**S(LS5)-11-3.1.** Describe ways technology can support and improve our understanding of environmental issues.

**S(LS5)-11-3.2.** Describe aspects of the medical system available to help people in New Hampshire, including: prevention programs, vaccines and pharmaceuticals, hospitals and rehabilitation facilities.

#### BIOTECHNOLOGIES

**S(LS5)-11-3.3.** Recognize that biotechnology is used in many areas, such as agriculture, pharmaceuticals, the environment, and genetic engineering, and understand that it requires extensive knowledge of the systems being changed.

**S(LS5)-11-3.4.** Explain how advances in agriculture made using biotechnology have directly affected the food production over the past 100 years, and that this change has profoundly affected societies all over the globe, making larger populations and urban centers a possibility.

#### 4. CAREER TECHNICAL EDUCATION CONNECTIONS

**S(LS5)-11-4.1.** Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to the life sciences.

**NEW HAMPSHIRE Grades 11–12 Life Science**  
Curriculum Frameworks

**NEW HAMPSHIRE Grades 11–12 Life Science**  
Curriculum Frameworks

**LS1.** All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).

**1. CLASSIFICATION**

**S(LS1)-12-1.1.** Differentiate between prokaryotic and eukaryotic cells at the biochemical level, using cell wall composition, DNA structure, and other biochemical pathways.

**2. LIVING THINGS & ORGANIZATION**

**S(LS1)-12-2.1.** Compare the processes of mitosis and meiosis, including disruptions to the cycles, such as disease or cancer.

**S(LS1)-12-2.2.** Explain the process of cell differentiation, using stem cells as an example.

**3. REPRODUCTION**

**S(LS1)-12-3.1.** Compare and contrast the alternation of generations life cycles and understand the variations of the haploid and diploid phases that produce diplontic, haplontic, and isomorphic alternation of generations in living organisms.

**LS2.** Energy flows and matter recycles through an ecosystem.

**1. ENVIRONMENT**

*None at this grade span.*

**2. FLOW OF ENERGY & RECYCLING OF MATERIALS**

*None at this grade span.*

**LS3.** Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).

**1. CHANGE**

*None at this grade span.*

**2. EVIDENCE OF EVOLUTION**

*None at this grade span.*

**3. NATURAL SELECTION**

**S(LS3)-12-3.1.** Understand the types of mutations that cause changes in DNA, and cause the appearance of new alleles, such as frameshift and point mutations, and the chromosomal mutations of insertion, deletion, translocation, and duplication.

**LS4.** Humans are similar to other species in many ways, and yet are unique among Earth's life forms.

**1. BEHAVIOR**

*None at this grade span.*

**2. DISEASE**

*None at this grade span.*

**3. HUMAN IDENTITY**

*None at this grade span.*

**LS5.** The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

**1. DESIGN TECHNOLOGY**

**S(LS5)-12-1.1.** Recognize the importance of technology as it relates to science, for purposes such as: access to information about living systems, medical diagnosis, sample collection and treatment, measurement, data collection, and storage, computation, and communication of information.

**2. TOOLS**

*None at this grade span.*

**3. SOCIAL ISSUES (LOCAL AND GLOBAL)**

**MEDICAL TECHNOLOGIES**

**S(LS5)-12-3.1.** Explain how genetic engineering is used to modify the DNA structure of an organism and describe how this process is used to research and develop medically useful products, such as insulin.

**S(LS5)-12-3.2.** Summarize arguments on both sides of a medical research controversy, such as stem cell research, cloning, or zootransplantation.

**BIOTECHNOLOGIES**

**S(LS5)-12-3.3.** Analyze and evaluate a biotechnology system in New Hampshire, that focuses on a specific goal, such as pharmaceutical development, and describe all elements of the system, identifying the costs and the benefits.

**4. CAREER TECHNICAL EDUCATION CONNECTIONS**

**S(LS5)-12-4.1.** Understand the various scientific fields that use scientific content and skills and distinguish between professional and skilled science jobs/careers in the life sciences.

NEW HAMPSHIRE Grades 9–11 Physical Science  
Curriculum Frameworks

NEW HAMPSHIRE Grade 9–11 Physical Science  
Curriculum Frameworks

**PS1.** All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).

1. COMPOSITION

**S(PS1)-11-1.1.** Recognize and describe the structure of an atom and explain how the major components interact with one another.

**S(PS1)-11-1.2.** Recognize how elements are arranged in the periodic table, and explain how this arrangement illustrates the repeating patterns among elements with similar properties, such as the relationship between atomic number and atomic mass.

**S(PS1)-11-1.3.** Explain that neutrons and protons are made up of even smaller constituents.

**S(PS1)-11-1.4.** Define isotopes, recognize that most elements have two or more isotopes, and explain that although the number of neutrons has little effect on how the atom interacts with others, they do affect the mass and stability of the nucleus.

**S(PS1)-11-1.5.** Scientific thought about atoms has changed over time. Using information (narratives or models of atoms) provided, cite evidence that changed our understanding of the atom and the development of atomic theory.

**S(PS1)-11-1.6.** Model and explain the structure of an atom or explain how an atom's electron configuration, particularly the outermost electron(s), determines how that atom can interact with other atoms.

2. PROPERTIES

**S(PS1)-11-2.1.** Explain that the physical properties of a compound are determined by its molecular structure and the interactions among the molecules.

**S(PS1)-11-2.2.** Determine whether an atom is either electrically neutral or an ion by referring to the number of electrons.

**S(PS1)-11-2.3.** Explain how the chemical properties of an element are governed by the electron configuration of atoms, and describe how atoms interact with one another by transferring or sharing the outermost electrons.

**S(PS1)-11-2.4.** Explain that radioactive materials are unstable and undergo spontaneous nuclear reactions, which emit particles and/or wavelike radiation.

**S(PS1)-11-2.5.** Explain that states of matter rely on the arrangement and motion of molecules, and differentiate between the structures of solids, liquids, and gases.

**S(PS1)-11-2.6.** Use physical and chemical properties as determined through an investigation to identify a substance.

**S(PS1)-11-2.7.** Explain how properties of elements and the location of elements on the periodic table are related.

**PS2.** Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.

1. CHANGE

**S(PS2)-11-1.1.** Recognize and explain that atoms may be bonded together into molecules or formula units (crystalline solids).

**S(PS2)-11-1.2.** Recognize that atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus and explain that the outer electrons govern the chemical properties of an element.

**S(PS2)-11-1.3.** Explain that compounds are formed through both ionic and covalent bonding.

**S(PS2)-11-1.4.** Recognize that the rates of chemical reactions can vary greatly, and identify the factors that influence these reaction rates, such as how often the reacting atoms and molecules encounter one another, the temperature, and the properties of the reacting species, including shape.

**S(PS2)-11-1.5.** Explain relationships between and among electric charges, magnetic fields, electromagnetic forces, and atomic particles.

2. CONSERVATION

**S(PS2)-11-2.1.** Explain that chemical reactions either release or consume energy.

**S(PS2)-11-2.2.** Explain that chemical reactions can be accelerated by catalysts, such as enzymes.

**S(PS2)-11-2.3.** Recognize that a large number of important reactions involve the transfer of either electrons or hydrogen ions between reacting ions, molecules, or atoms.

**S(PS2)-11-2.4.** Identify the variety of structures that may be formed from the bonding of carbon atoms, and describe their roles in various chemical reactions, including those required for life processes.

**S(PS2)-11-2.5.** Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and physical systems).

3. ENERGY

**S(PS2)-11-3.1.** Explain that all energy can be considered to be either kinetic energy, potential energy, or energy contained by a field.

**S(PS2)-11-3.2.** Provide examples of how kinetic and potential energy can be transformed from one to the other.

**S(PS2)-11-3.3.** Describe how the energy associated with individual atoms and molecules can be used to identify the substances they comprise; and explain that each kind of atom or molecule can gain or lose energy

only in particular discrete amounts, absorbing and emitting light only at wavelengths corresponding to these amounts.

**S(PS2)-11-3.4.** Explain the range of the electromagnetic spectrum as it relates to both wavelength and energy, and provide examples of practical applications of the different wavelengths in the spectrum.

**S(PS2)-11-3.5.** Recognize that the human eye can only see a narrow range of wavelengths within the electromagnetic spectrum; and explain how the variations of wavelength within that range of visible light are perceived as differences in color.

**S(PS2)-11-3.6.** Describe the relationship between heat and temperature, explaining that heat energy consists of the random motion and vibrations of atoms, molecules, and ions and that the higher the temperature, the greater the atomic or molecular motion.

**S(PS2)-11-3.7.** Explain that waves, such as light, seismic, sound waves, have energy and can transfer energy when they interact with matter.

**S(PS2)-11-3.8.** Explain that nuclear reactions convert a fraction of the mass of interacting particles into energy and release much greater amounts of energy than atomic interactions.

**S(PS2)-11-3.9.** Describe how electrons flow easily in some materials, such as metals, whereas in insulating materials, such as glass, they can hardly flow at all.

**S(PS2)-11-3.10.** Using information provided about chemical changes, draw conclusions about the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions).

**PS3.** The motion of an object is affected by force.

## 1. FORCES

**S(PS3)-11-1.1.** Explain that magnetic forces are related to the action of electrons and can be thought of as different aspects of a single electromagnetic force; and describe how the interplay of these forces is the basis for electric motors, generators, radio, television, and many other modern technologies.

**S(PS3)-11-1.2.** Recognize that the strength of the electric force between two charged objects is proportional to the charges and, as with gravitation, is inversely proportional to the square of the distance between them.

**S(PS3)-11-1.3.** Recognize that the strength of the gravitational force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.

**S(PS3)-11-1.4.** Compare the strength of nuclear, electromagnetic and gravitational forces; and explain that the strength of nuclear forces account for the great amounts of energy released from the nuclear reactions in atomic or hydrogen bombs, and in the Sun and other stars.

**S(PS3)-11-1.5.** Recognize that electromagnetic forces exist within and between atoms.

**S(PS3)-11-1.6.** Recognize that different kinds of materials respond to electric forces in various ways, and differentiate between insulators, semiconductors, conductors and superconductors.

**S(PS3)-11-1.7.** Describe the difference between materials that contain equal proportions of positive and negative charges and those that have a very small excess or deficit of negative charges.

**S(PS3)-11-1.8.** Given information (e.g., graphs, data, diagrams), use the relationships between or among force, mass, velocity, momentum, acceleration to predict and explain the motion of objects.

## 2. MOTION

**S(PS3)-11-2.1.** Interpret and apply the laws of motion to determine the effects of forces on the motion of objects.

**S(PS3)-11-2.2.** Recognize that apparent changes in wavelength can provide information about changes in motion, explain that the observed wavelength of a wave depends upon the relative motion of the source and the observer, and relates these to the differences between shorter and longer wavelengths.

**S(PS3)-11-2.3.** Apply the concepts of inertia, motion, and momentum to predict and explain situations involving forces and motion, including stationary objects and collisions.

**S(PS3)-11-2.4.** Explain the effects on wavelength and frequency as electromagnetic waves interact with matter (e.g., light diffraction, blue sky).

**PS4.** The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

## 1. DESIGN TECHNOLOGY

**S(PS4)-11-1.1.** Recognize the basic principles of energy, work and power are related to design technology.

## 2. TOOLS

**S(PS4)-11-2.1.** Identify tools, such as thermostats and thermal sensors, and explain their use in environmental control systems.

## 3. SOCIAL ISSUES (LOCAL & GLOBAL)

### ENERGY, POWER, AND TRANSPORTATION

**S(PS4)-11-3.1.** Explain that power systems have a source of energy, a process, loads, and some have a feedback system.

**S(PS4)-11-3.2.** Demonstrate and explain how an engine converts chemical energy in the form of fuel, into mechanical energy in the form of motion.

**S(PS4)-11-3.3.** Calculate the efficiency of an engine, and explain why a perfectly efficient engine is impossible.



**S(PS4)-11-3.4.** Explain the relationship between energy and power.

**MANUFACTURING**

**S(PS4)-11-3.5.** Explain the benefits of standardization of parts.

**4. CAREER TECHNICAL EDUCATION CONNECTIONS**

**S(PS4)-11-4.1.** Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to the life sciences.

# NEW HAMPSHIRE Grades 11–12 Physical Science Curriculum Frameworks

## NEW HAMPSHIRE Grade 11–12 Physical Science Curriculum Frameworks

**PS1.** All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).

### 1. COMPOSITION

**S(PS1)-12-1.1.** Understand the basic building blocks of matter are quarks and leptons.

**S(PS1)-12-1.2.** Recognize the main ideas of string theory.

**S(PS1)-12-1.3.** Identify the sub-orbital shapes and geometric orientations of the orbitals electrons can occupy in atoms.

### 2. PROPERTIES

*None at this grade span.*

**PS2.** Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.

### 1. CHANGE

**S(PS2)-12-1.1.** Explain the complete mole concept and identify ways in which it can be used, such as to differentiate between actual and relative mass.

### 2. CONSERVATION

*None at this grade span.*

### 3. ENERGY

**S(PS2)-12-3.1.** Explain the concept of entropy.

**S(PS2)-12-3.2.** Understand that activation energy is required to make a chemical reaction proceed, whether or not it is exothermic or endothermic.

**PS3.** The motion of an object is affected by force.

### 1. FORCES

**S(PS3)-12-1.1.** Understand the four fundamental forces found in nature: gravitation, electromagnetism, strong nuclear force, and weak nuclear force.

**S(PS3)-12-1.2.** Describe the gauge particles that are exchanged by each of the fundamental forces.

**S(PS3)-12-1.3.** Understand the basic principles of unified field theories.

### 2. MOTION

**S(PS3)-12-2.1.** Explain general concepts related to the theory of special relativity, time dilation, length contraction, and mass expansion.

**S(PS3)-12-2.2.** Understand the basic idea behind the theory of general relativity.

**S(PS3)-12-2.3.** Describe the predictions made by the theory of general relativity, and the evidence that supports it.

**PS4.** The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

### 1. DESIGN TECHNOLOGY

**S(PS4)-12-1.1.** Relate the transfer of energy through conduction, convection and radiation to design technologies.

### 2. TOOLS

**S(PS4)-12-2.1.** Demonstrate the appropriate use of a variety of input devices, such as scanners, voice/sound recorders, and digital cameras.

### 3. SOCIAL ISSUES (LOCAL & GLOBAL)

#### ENERGY, POWER, AND TRANSPORTATION

**S(PS4)-12-3.1.** Compare two different energy systems that are used to produce large amounts of electrical power for New Hampshire residents, and describe the advantages and disadvantages of each system.

**S(PS4)-12-3.2.** Design a transportation system that meets most human's need for reliable and affordable transportation, while having a minimal impact on the environment.

#### MANUFACTURING

**S(PS4)-12-3.3.** Describe the various types of manufacturing systems, such as customized production, batch production, and continuous production, and explain that manufacturing results in two types of good, durable and non-durable goods.

**S(PS4)-12-3.4.** Understand that a manufacturing system includes design of the product and methods of obtaining raw materials, as well as actual production, marketing, sales, maintenance, servicing, repair, and final disposal of the remains of the product.

### 4. CAREER TECHNICAL EDUCATION CONNECTIONS

**S(PS4)-12-4.1.** Understand the various scientific fields that use scientific content and skills and distinguish between professional and skilled science jobs/careers in the life sciences

**NEW HAMPSHIRE Grade 11 Science Process Skills**  
Curriculum Frameworks

**NEW HAMPSHIRE Grade 11 Science Process Skills**  
Curriculum Frameworks

**SPS1. Scientific Inquiry and Critical Thinking Skills (INQ)**

**1. MAKING OBSERVATIONS AND ASKING QUESTIONS**

**S(SPS1)-11-1.1** Ask questions about relationships among variables that can be observed directly as well as those that cannot.

**S(SPS1)-11-1.2** Use complex classification criteria and keys to identify items/organisms.

**S(SPS1)-11-1.3** Evaluate complex methods of classification for a specific purpose.

**S(SPS1)-11-1.4** Identify limitations of a given classification system and identify alternative ways of classifying to accommodate anomalies.

**2. DESIGNING SCIENTIFIC INVESTIGATIONS**

**S(SPS1)-11-2.1** Apply scientific theories and laws to new situations to generate hypotheses.

**S(SPS1)-11-2.2** State a hypothesis and prediction based on available evidence and background information.

**3. CONDUCTING SCIENTIFIC INVESTIGATIONS**

**S(SPS1)-11-3.1** Select and use apparatus and material safely.

**S(SPS1)-11-3.2** Use instruments effectively and accurately for collecting data.

**S(SPS1)-11-3.3** Compile and organize data, using appropriate units.

**4. REPRESENTING AND UNDERSTANDING RESULTS OF INVESTIGATIONS**

**S(SPS1)-11-4.1** Compile and display data, evidence and information by hand and computer, in a variety of formats, including diagrams, flow charts, tables, graphs and scatter plots.

**5. EVALUATING SCIENTIFIC EXPLANATIONS**

**S(SPS1)-11-5.1** Explain how data support or refute the hypothesis or prediction.

**S(SPS1)-11-5.2** Provide a statement that addresses and answers the question investigated in light of the evidence generated in the investigation.

**SPS2. Unifying Concepts of Science**

**1. NATURE OF SCIENCE (NOS)**

**S(SPS2)-11-1.1** Explore new phenomena through investigations conducted for different reasons, or to check on previous results.

**S(SPS2)-11-1.2** Test how well a theory predicts a phenomena.

**S(SPS2)-11-1.3** Sometimes scientists can control conditions in order to focus on the effect of a single variable. When that is not possible for practical or

ethical reasons, they try to observe as wide a range of natural occurrences as possible to be able to discern patterns.

**S(SPS2)-11-1.4** Hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available).

**S(SPS2)-11-1.5** In the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.

**S(SPS2)-11-1.6** The usefulness of a model can be tested by comparing its predictions to actual observations in the real world. But a close match does not mean that the model is the only “true” model or the one that would work.

**S(SPS2)-11-1.7** In science, the testing, revising, and occasional discarding of theories, new and old, never ends. This ongoing process leads to an increasingly better understanding of how things work in the world but not to absolute truth.

**2. SYSTEMS AND ENERGY (SAE) (includes Systems, Order and Organization)**

**S(SPS2)-11-2.1** Systems may be so closely related that there is no way to draw boundaries that separate all parts of one from all parts of the others.

**S(SPS2)-11-2.2** A system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts.

**S(SPS2)-11-2.3** Even in some very simple systems, it may not always be possible to predict accurately the result of changing some part or connection.

**3. MODELS AND SCALE (MAS) (Evidence, Models, Measurement, And Explanation)**

**S(SPS2)-11-3.1** The basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same way as the objects or processes under investigation. A mathematical model may give insight about how something really works or may fit observations very well without any intuitive meaning.

**4. PATTERNS OF CHANGE (POC) (Constancy, Change, Evolution And Equilibrium)**

**S(SPS2)-11-4.1** Things can change in detail, but remain the same in general (the players change but the team remains; the cells are replaced, but the organism remains). Sometimes counterbalancing changes are necessary for a thing to retain its essential constancy in the presence of changing conditions.

**S(SPS2)-11-4.2** Graphs and equations are useful (and often equivalent) ways for depicting and analyzing patterns of change.

**S(SPS2)-11-4.3** A system in equilibrium may return to the same state of equilibrium if the disturbances it

experiences are small. But large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium.

**S(SPS2)-11-4.4** In evolutionary change, the present arises from the materials and forms of the past, more or less gradually, and in ways that can be explained.

## 5. FORM AND FUNCTION (FAF)

**S(SPS2)-11-5.1** Explore how the movement of ocean floor plates under continental plates or two continental plates moving against each other can deform the earth's surface.

**S(SPS2)-11-5.2** Provide data and evidence on how folding in crustal plates can cause mountain ranges.

**S(SPS2)-11-5.3** Understand that an atom's electron configuration determines how the atom can interact with other atoms.

**S(SPS2)-11-5.4** Provide examples of how configuration of atoms in a molecule determines a molecule's properties.

**S(SPS2)-11-5.5** Discover how the shape of large molecules effects the interaction with other molecules.

**S(SPS2)-11-5.6** Demonstrate that a variety of biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.

SPS3. Personal, Social, and Technological Perspectives (Includes Design)

### 1. COLLABORATION IN SCIENTIFIC ENDEAVORS

**S(SPS3)-11-1.1** Collaborate with existing research efforts.

**S(SPS3)-11-1.2** Identify global researchers in a field of interest

## 2. COMMON ENVIRONMENTAL ISSUES, NATURAL RESOURCES MANAGEMENT AND CONSERVATION

**S(SPS3)-11-2.1** Develop, modify, clarify and explain questions that guide environmental investigations of various types.

**S(SPS3)-11-2.2** Design investigations to answer particular questions about the environment.

**S(SPS3)-11-2.3** Locate and collect reliable information for environmental investigations of many types.

**S(SPS3)-11-2.4** Apply basic logic and reasoning skills to evaluate completeness and reliability in a variety of information sources.

**S(SPS3)-11-2.5** Organize and display information in ways appropriate to different types of environmental investigations and purposes.

**S(SPS3)-11-2.6** Create, use and evaluate models to understand environmental phenomena.

**S(SPS3)-11-2.7** Use to evidence and logic in developing proposed explanations that address their initial questions and hypotheses.

**S(SPS3)-11-2.8** Analyze global, social, cultural, political, economic and environmental linkages.

**S(SPS3)-11-2.9** Evaluate presentations of environmental issues for accuracy.

## 3. SCIENCE AND TECHNOLOGY; TECHNOLOGICAL DESIGN AND APPLICATION

**S(SPS3)-11-3.1** Analyze environmental issues such as water quality, air quality, hazardous waste, and depletion of natural resources.

**S(SPS3)-11-3.2** Evaluate status of a local community system (transportation, water, communication, food resources or electrical) in partnership with local officials.

**S(SPS3)-11-3.3** Analyze technical writing, graphs, charts, and diagrams.

## Section C: **ACT's College Readiness Standards Included in New Hampshire's Grades 8–12 Curriculum Frameworks**

Using thousands of student records and responses, content and measurement experts worked backwards to develop data-driven, empirically derived statements of what students know and are typically able to do in various score ranges on the English, Reading, Writing, Mathematics, and Science tests on the EXPLORE, PLAN, and ACT tests. These empirically derived score descriptors are called **ACT's College Readiness Standards**. Because of this unique way the ACT Standards were derived, ACT's Standards contain specific descriptions of proficiency and content, including descriptions of the complexity of the test material. The ACT standards prove to be an effective way to communicate the skills and knowledge measured by our EXPLORE, PLAN, and ACT tests.

In this section (Section C), the ACT Standards that are highlighted are those that are included in New Hampshire's Curriculum Frameworks. ACT Standards not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in New Hampshire's Curriculum Frameworks.

Because New Hampshire educators are the experts on the New Hampshire Grade-Level and Grade-Span Expectations, we would strongly encourage them to examine this document and offer their interpretations.



**Table C-1. ACT’s College Readiness Standards — English**

	<b>Topic Development in Terms of Purpose and Focus</b>	<b>Organization, Unity, and Coherence</b>	<b>Word Choice in Terms of Style, Tone, Clarity, and Economy</b>
13–15		Use conjunctive adverbs or phrases to show time relationships in simple narrative essays (e.g., <i>then, this time</i> )	Revise sentences to correct awkward and confusing arrangements of sentence elements  Revise vague nouns and pronouns that create obvious logic problems
16–19	Identify the basic purpose or role of a specified phrase or sentence  Delete a clause or sentence because it is obviously irrelevant to the essay	Select the most logical place to add a sentence in a paragraph	Delete obviously synonymous and wordy material in a sentence  Revise expressions that deviate from the style of an essay
20–23	Identify the central idea or main topic of a straightforward piece of writing  Determine relevancy when presented with a variety of sentence-level details	Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., <i>first, afterward, in response</i> )  Decide the most logical place to add a sentence in an essay  Add a sentence that introduces a simple paragraph	Delete redundant material when information is repeated in different parts of speech (e.g., “alarmingly startled”)  Use the word or phrase most consistent with the style and tone of a fairly straightforward essay  Determine the clearest and most logical conjunction to link clauses
24–27	Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal  Delete material primarily because it disturbs the flow and development of the paragraph  Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement	Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., <i>therefore, however, in addition</i> )  Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic  Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward	Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence  Identify and correct ambiguous pronoun references  Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay
28–32	Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence, or to determine the need to delete plausible but irrelevant material  Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation	Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs  Rearrange sentences to improve the logic and coherence of a complex paragraph  Add a sentence to introduce or conclude a fairly complex paragraph	Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., “an aesthetic viewpoint” versus “the outlook of an aesthetic viewpoint”)  Correct vague and wordy or clumsy and confusing writing containing sophisticated language
33–36	Determine whether a complex essay has accomplished a specific purpose  Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay	Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay	Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole

**Table C-1. ACT’s College Readiness Standards — English (continued)**

	<b>Sentence Structure and Formation</b>	<b>Conventions of Usage</b>	<b>Conventions of Punctuation</b>
13–15	<p>Use conjunctions or punctuation to join simple clauses</p> <p>Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences</p>	<p>Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives</p>	<p>Delete commas that create basic sense problems (e.g., between verb and direct object)</p>
16–19	<p>Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences</p> <p>Decide the appropriate verb tense and voice by considering the meaning of the entire sentence</p>	<p>Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject-verb and pronoun-antecedent agreement, and which preposition to use in simple contexts</p> <p>Recognize and use the appropriate word in frequently confused pairs such as <i>there</i> and <i>their</i>, <i>past</i> and <i>passed</i>, and <i>led</i> and <i>lead</i></p>	<p>Provide appropriate punctuation in straightforward situations (e.g., items in a series)</p> <p>Delete commas that disturb the sentence flow (e.g., between modifier and modified element)</p>
20–23	<p>Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers)</p>	<p>Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., <i>long for</i>, <i>appeal to</i>)</p> <p>Ensure that a verb agrees with its subject when there is some text between the two</p>	<p>Use commas to set off simple parenthetical phrases</p> <p>Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause)</p>
24–27	<p>Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems</p> <p>Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence</p>	<p>Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences</p> <p>Identify the correct past and past participle forms of irregular and infrequently used verbs and form present-perfect verbs by using <i>have</i> rather than <i>of</i></p>	<p>Use punctuation to set off complex parenthetical phrases</p> <p>Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by <i>and</i>)</p> <p>Use apostrophes to indicate simple possessive nouns</p> <p>Recognize inappropriate uses of colons and semicolons</p>
28–32	<p>Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs</p> <p>Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole</p>	<p>Correctly use reflexive pronouns, the possessive pronouns <i>its</i> and <i>your</i>, and the relative pronouns <i>who</i> and <i>whom</i></p> <p>Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject-verb order is inverted or when the subject is an indefinite pronoun)</p>	<p>Use commas to set off a nonessential/nonrestrictive appositive or clause</p> <p>Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical)</p> <p>Use an apostrophe to show possession, especially with irregular plural nouns</p> <p>Use a semicolon to indicate a relationship between closely related independent clauses</p>
33–36	<p>Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses</p>	<p>Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas</p> <p>Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb</p>	<p>Use a colon to introduce an example or an elaboration</p>

**Table C-2. ACT’s College Readiness Standards — Reading**

	<b>Main Ideas and Author’s Approach</b>	<b>Supporting Details</b>
13–15	Recognize a clear intent of an author or narrator in uncomplicated literary narratives	Locate basic facts (e.g., names, dates, events) clearly stated in a passage
16–19	Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives	Locate simple details at the sentence and paragraph level in uncomplicated passages Recognize a clear function of a part of an uncomplicated passage
20–23	Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages	Locate important details in uncomplicated passages Make simple inferences about how details are used in passages
24–27	Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages Infer the main idea or purpose of straightforward paragraphs in more challenging passages Summarize basic events and ideas in more challenging passages Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages	Locate important details in more challenging passages Locate and interpret minor or subtly stated details in uncomplicated passages Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages
28–32	Infer the main idea or purpose of more challenging passages or their paragraphs Summarize events and ideas in virtually any passage Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage	Locate and interpret minor or subtly stated details in more challenging passages Use details from different sections of some complex informational passages to support a specific point or argument
33–36	Identify clear main ideas or purposes of complex passages or their paragraphs	Locate and interpret details in complex passages Understand the function of a part of a passage when the function is subtle or complex

**Descriptions of the ACT Reading Passages**

**Uncomplicated Literary Narratives** refers to excerpts from essays, short stories, and novels that tend to use simple language and structure, have a clear purpose and a familiar style, present straightforward interactions between characters, and employ only a limited number of literary devices such as metaphor, simile, or hyperbole.

**More Challenging Literary Narratives** refers to excerpts from essays, short stories, and novels that tend to make moderate use of figurative language, have a more intricate structure and messages conveyed with some subtlety, and may feature somewhat complex interactions between characters.

**Complex Literary Narratives** refers to excerpts from essays, short stories, and novels that tend to make generous use of ambiguous language and literary devices, feature complex and subtle interactions between characters, often contain challenging context-dependent vocabulary, and typically contain messages and/or meanings that are not explicit but are embedded in the passage.



**Table C-2. ACT’s College Readiness Standards — Reading (continued)**

	<b>Sequential, Comparative, and Cause-Effect Relationships</b>	<b>Meanings of Words</b>	<b>Generalizations and Conclusions</b>
13–15	Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages Recognize clear cause-effect relationships described within a single sentence in a passage	Understand the implication of a familiar word or phrase and of simple descriptive language	Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives
16–19	Identify relationships between main characters in uncomplicated literary narratives Recognize clear cause-effect relationships within a single paragraph in uncomplicated literary narratives	Use context to understand basic figurative language	Draw simple generalizations and conclusions about people, ideas, and so on in uncomplicated passages
20–23	Order simple sequences of events in uncomplicated literary narratives Identify clear relationships between people, ideas, and so on in uncomplicated passages Identify clear cause-effect relationships in uncomplicated passages	Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages	Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages Draw simple generalizations and conclusions using details that support the main points of more challenging passages
24–27	Order sequences of events in uncomplicated passages Understand relationships between people, ideas, and so on in uncomplicated passages Identify clear relationships between characters, ideas, and so on in more challenging literary narratives Understand implied or subtly stated cause-effect relationships in uncomplicated passages Identify clear cause-effect relationships in more challenging passages	Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages	Draw subtle generalizations and conclusions about characters, ideas, and so on in uncomplicated literary narratives Draw generalizations and conclusions about people, ideas, and so on in more challenging passages
28–32	Order sequences of events in more challenging passages Understand the dynamics between people, ideas, and so on in more challenging passages Understand implied or subtly stated cause-effect relationships in more challenging passages	Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts	Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so on
33–36	Order sequences of events in complex passages Understand the subtleties in relationships between people, ideas, and so on in virtually any passage Understand implied, subtle, or complex cause-effect relationships in virtually any passage	Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage	Draw complex or subtle generalizations and conclusions about people, ideas, and so on, often by synthesizing information from different portions of the passage Understand and generalize about portions of a complex literary narrative

**Uncomplicated Informational Passages** refers to materials that tend to contain a limited amount of data, address basic concepts using familiar language and conventional organizational patterns, have a clear purpose, and are written to be accessible.

**More Challenging Informational Passages** refers to materials that tend to present concepts that are not always stated explicitly and that are accompanied or illustrated by more—and more detailed—supporting data, include some difficult context-dependent words, and are written in a somewhat more demanding and less accessible style.

**Complex Informational Passages** refers to materials that tend to include a sizable amount of data, present difficult concepts that are embedded (not explicit) in the text, use demanding words and phrases whose meaning must be determined from context, and are likely to include intricate explanations of processes or events.

**Table C-3. ACT’s College Readiness Standards — Writing**

	<b>Expressing Judgments</b>	<b>Focusing on the Topic</b>	<b>Developing a Position</b>
<b>3–4</b>	<p>Show a little understanding of the persuasive purpose of the task but neglect to take or to maintain a position on the issue in the prompt</p> <p>Show limited recognition of the complexity of the issue in the prompt</p>	<p>Maintain a focus on the general topic in the prompt through most of the essay</p>	<p>Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas</p> <p>Show little or no movement between general and specific ideas and examples</p>
<b>5–6</b>	<p>Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt but may not maintain that position</p> <p>Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer’s position</p>	<p>Maintain a focus on the general topic in the prompt throughout the essay</p>	<p>Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas</p> <p>Show little movement between general and specific ideas and examples</p>
<b>7–8</b>	<p>Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt</p> <p>Show some recognition of the complexity of the issue in the prompt by</p> <ul style="list-style-type: none"> <li>acknowledging counterarguments to the writer’s position</li> <li>providing some response to counterarguments to the writer’s position</li> </ul>	<p>Maintain a focus on the general topic in the prompt throughout the essay and attempt a focus on the specific issue in the prompt</p> <p>Present a thesis that establishes focus on the topic</p>	<p>Develop ideas by using some specific reasons, details, and examples</p> <p>Show some movement between general and specific ideas and examples</p>
<b>9–10</b>	<p>Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion</p> <p>Show recognition of the complexity of the issue in the prompt by</p> <ul style="list-style-type: none"> <li>partially evaluating implications and/or complications of the issue, and/or</li> <li>posing and partially responding to counterarguments to the writer’s position</li> </ul>	<p>Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay</p> <p>Present a thesis that establishes a focus on the writer’s position on the issue</p>	<p>Develop most ideas fully, using some specific and relevant reasons, details, and examples</p> <p>Show clear movement between general and specific ideas and examples</p>
<b>11–12</b>	<p>Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion</p> <p>Show understanding of the complexity of the issue in the prompt by</p> <ul style="list-style-type: none"> <li>examining different perspectives, and/or</li> <li>evaluating implications or complications of the issue, and/or</li> <li>posing and fully discussing counterarguments to the writer’s position</li> </ul>	<p>Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay</p> <p>Present a critical thesis that clearly establishes the focus on the writer’s position on the issue</p>	<p>Develop several ideas fully, using specific and relevant reasons, details, and examples</p> <p>Show effective movement between general and specific ideas and examples</p>

**Table C-3. ACT's College Readiness Standards — Writing (continued)**

	<b>Organizing Ideas</b>	<b>Using Language</b>
<b>3–4</b>	<p>Provide a discernible organization with some logical grouping of ideas in parts of the essay</p> <p>Use a few simple and obvious transitions</p> <p>Present a discernible, though minimally developed, introduction and conclusion</p>	<p>Show limited control of language by</p> <ul style="list-style-type: none"> <li>• correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding</li> <li>• using simple vocabulary</li> <li>• using simple sentence structure</li> </ul>
<b>5–6</b>	<p>Provide a simple organization with logical grouping of ideas in parts of the essay</p> <p>Use some simple and obvious transitional words, though they may at times be inappropriate or misleading</p> <p>Present a discernible, though underdeveloped, introduction and conclusion</p>	<p>Show a basic control of language by</p> <ul style="list-style-type: none"> <li>• correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding</li> <li>• using simple but appropriate vocabulary</li> <li>• using a little sentence variety, though most sentences are simple in structure</li> </ul>
<b>7–8</b>	<p>Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas</p> <p>Use some simple and obvious, but appropriate, transitional words and phrases</p> <p>Present a discernible introduction and conclusion with a little development</p>	<p>Show adequate use of language to communicate by</p> <ul style="list-style-type: none"> <li>• correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding</li> <li>• using appropriate vocabulary</li> <li>• using some varied kinds of sentence structures to vary pace</li> </ul>
<b>9–10</b>	<p>Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas</p> <p>Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas</p> <p>Present a somewhat developed introduction and conclusion</p>	<p>Show competent use of language to communicate ideas by</p> <ul style="list-style-type: none"> <li>• correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding</li> <li>• using some precise and varied vocabulary</li> <li>• using several kinds of sentence structures to vary pace and to support meaning</li> </ul>
<b>11–12</b>	<p>Provide unity and coherence throughout the essay, often with a logical progression of ideas</p> <p>Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas</p> <p>Present a well-developed introduction and conclusion</p>	<p>Show effective use of language to clearly communicate ideas by</p> <ul style="list-style-type: none"> <li>• correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors</li> <li>• using precise and varied vocabulary</li> <li>• using a variety of kinds of sentence structures to vary pace and to support meaning</li> </ul>

**Table C-4. ACT's College Readiness Standards — Mathematics**

	<b>Basic Operations &amp; Applications</b>	<b>Probability, Statistics, &amp; Data Analysis</b>	<b>Numbers: Concepts &amp; Properties</b>	<b>Expressions, Equations, &amp; Inequalities</b>
13–15	<p>Perform one-operation computation with whole numbers and decimals</p> <p>Solve problems in one or two steps using whole numbers</p> <p>Perform common conversions (e.g., inches to feet or hours to minutes)</p>	<p>Calculate the average of a list of positive whole numbers</p> <p>Perform a single computation using information from a table or chart</p>	<p>Recognize equivalent fractions and fractions in lowest terms</p>	<p>Exhibit knowledge of basic expressions (e.g., identify an expression for a total as <math>b + g</math>)</p> <p>Solve equations in the form <math>x + a = b</math>, where <math>a</math> and <math>b</math> are whole numbers or decimals</p>
16–19	<p>Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent</p> <p>Solve some routine two-step arithmetic problems</p>	<p>Calculate the average of a list of numbers</p> <p>Calculate the average, given the number of data values and the sum of the data values</p> <p>Read tables and graphs</p> <p>Perform computations on data from tables and graphs</p> <p>Use the relationship between the probability of an event and the probability of its complement</p>	<p>Recognize one-digit factors of a number</p> <p>Identify a digit's place value</p>	<p>Substitute whole numbers for unknown quantities to evaluate expressions</p> <p>Solve one-step equations having integer or decimal answers</p> <p>Combine like terms (e.g., <math>2x + 5x</math>)</p>
20–23	<p>Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average</p>	<p>Calculate the missing data value, given the average and all data values but one</p> <p>Translate from one representation of data to another (e.g., a bar graph to a circle graph)</p> <p>Determine the probability of a simple event</p> <p>Exhibit knowledge of simple counting techniques</p>	<p>Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor</p>	<p>Evaluate algebraic expressions by substituting integers for unknown quantities</p> <p>Add and subtract simple algebraic expressions</p> <p>Solve routine first-degree equations</p> <p>Perform straightforward word-to-symbol translations</p> <p>Multiply two binomials</p>
24–27	<p>Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour)</p>	<p>Calculate the average, given the frequency counts of all the data values</p> <p>Manipulate data from tables and graphs</p> <p>Compute straightforward probabilities for common situations</p> <p>Use Venn diagrams in counting</p>	<p>Find and use the least common multiple</p> <p>Order fractions</p> <p>Work with numerical factors</p> <p>Work with scientific notation</p> <p>Work with squares and square roots of numbers</p> <p>Work problems involving positive integer exponents</p> <p>Work with cubes and cube roots of numbers</p> <p>Determine when an expression is undefined</p> <p>Exhibit some knowledge of the complex numbers</p>	<p>Solve real-world problems using first-degree equations</p> <p>Write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions)</p> <p>Identify solutions to simple quadratic equations</p> <p>Add, subtract, and multiply polynomials</p> <p>Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)</p> <p>Solve first-degree inequalities that do not require reversing the inequality sign</p>
28–32	<p>Solve word problems containing several rates, proportions, or percentages</p>	<p>Calculate or use a weighted average</p> <p>Interpret and use information from figures, tables, and graphs</p> <p>Apply counting techniques</p> <p>Compute a probability when the event and/or sample space are not given or obvious</p>	<p>Apply number properties involving prime factorization</p> <p>Apply number properties involving even/odd numbers and factors/multiples</p> <p>Apply number properties involving positive/negative numbers</p> <p>Apply rules of exponents</p> <p>Multiply two complex numbers</p>	<p>Manipulate expressions and equations</p> <p>Write expressions, equations, and inequalities for common algebra settings</p> <p>Solve linear inequalities that require reversing the inequality sign</p> <p>Solve absolute value equations</p> <p>Solve quadratic equations</p> <p>Find solutions to systems of linear equations</p>
33–36	<p>Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in geometry settings)</p>	<p>Distinguish between mean, median, and mode for a list of numbers</p> <p>Analyze and draw conclusions based on information from figures, tables, and graphs</p> <p>Exhibit knowledge of conditional and joint probability</p>	<p>Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers</p> <p>Exhibit knowledge of logarithms and geometric sequences</p> <p>Apply properties of complex numbers</p>	<p>Write expressions that require planning and/or manipulating to accurately model a situation</p> <p>Write equations and inequalities that require planning, manipulating, and/or solving</p> <p>Solve simple absolute value inequalities</p>

**Table C-4. ACT's College Readiness Standards — Mathematics (continued)**

	<b>Graphical Representations</b>	<b>Properties of Plane Figures</b>	<b>Measurement</b>	<b>Functions</b>
13–15	Identify the location of a point with a positive coordinate on the number line		Estimate or calculate the length of a line segment based on other lengths given on a geometric figure	
16–19	Locate points on the number line and in the first quadrant	Exhibit some knowledge of the angles associated with parallel lines	Compute the perimeter of polygons when all side lengths are given Compute the area of rectangles when whole number dimensions are given	
20–23	Locate points in the coordinate plane Comprehend the concept of length on the number line Exhibit knowledge of slope	Find the measure of an angle using properties of parallel lines Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	Compute the area and perimeter of triangles and rectangles in simple problems Use geometric formulas when all necessary information is given	Evaluate quadratic functions, expressed in function notation, at integer values
24–27	Identify the graph of a linear inequality on the number line Determine the slope of a line from points or equations Match linear graphs with their equations Find the midpoint of a line segment	Use several angle properties to find an unknown angle measure Recognize Pythagorean triples Use properties of isosceles triangles	Compute the area of triangles and rectangles when one or more additional simple steps are required Compute the area and circumference of circles after identifying necessary information Compute the perimeter of simple composite geometric figures with unknown side lengths	Evaluate polynomial functions, expressed in function notation, at integer values Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths
28–32	Interpret and use information from graphs in the coordinate plane Match number line graphs with solution sets of linear inequalities Use the distance formula Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle)	Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles Use the Pythagorean theorem	Use relationships involving area, perimeter, and volume of geometric figures to compute another measure	Evaluate composite functions at integer values Apply basic trigonometric ratios to solve right-triangle problems
33–36	Match number line graphs with solution sets of simple quadratic inequalities Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$ Solve problems integrating multiple algebraic and/or geometric concepts Analyze and draw conclusions based on information from graphs in the coordinate plane	Draw conclusions based on a set of conditions Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas Use relationships among angles, arcs, and distances in a circle	Use scale factors to determine the magnitude of a size change Compute the area of composite geometric figures when planning or visualization is required	Write an expression for the composite of two simple functions Use trigonometric concepts and basic identities to solve problems Exhibit knowledge of unit circle trigonometry Match graphs of basic trigonometric functions with their equations

**Table C-5. ACT’s College Readiness Standards — Science**

	Interpretation of Data	Scientific Investigation	Evaluation of Models, Inferences, and Experimental Results
13–15	Select a single piece of data (numerical or nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables; a food web diagram) Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels)		
16–19	Select two or more pieces of data from a simple data presentation Understand basic scientific terminology Find basic information in a brief body of text Determine how the value of one variable changes as the value of another variable changes in a simple data presentation	Understand the methods and tools used in a simple experiment	
20–23	Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram) Compare or combine data from a simple data presentation (e.g., order or sum data from a table) Translate information into a table, graph, or diagram	Understand the methods and tools used in a moderately complex experiment Understand a simple experimental design Identify a control in an experiment Identify similarities and differences between experiments	Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model Identify key issues or assumptions in a model
24–27	Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table) Compare or combine data from a complex data presentation Interpolate between data points in a table or graph Determine how the value of one variable changes as the value of another variable changes in a complex data presentation Identify and/or use a simple (e.g., linear) mathematical relationship between data Analyze given information when presented with new, simple information	Understand the methods and tools used in a complex experiment Understand a complex experimental design Predict the results of an additional trial or measurement in an experiment Determine the experimental conditions that would produce specified results	Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a simple hypothesis or conclusion, and why Identify strengths and weaknesses in one or more models Identify similarities and differences between models Determine which model(s) is(are) supported or weakened by new information Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion
28–32	Compare or combine data from a simple data presentation with data from a complex data presentation Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data Extrapolate from data points in a table or graph	Determine the hypothesis for an experiment Identify an alternate method for testing a hypothesis	Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model Determine whether new information supports or weakens a model, and why Use new information to make a prediction based on a model
33–36	Compare or combine data from two or more complex data presentations Analyze given information when presented with new, complex information	Understand precision and accuracy issues Predict how modifying the design or methods of an experiment will affect results Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results	Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a complex hypothesis or conclusion, and why

**Science College Readiness Standards are measured in the context of science topics students encounter in science courses. These topics may include:**

Life Science/Biology	Physical Science/Chemistry, Physics	Earth & Space Science
<ul style="list-style-type: none"> <li>• Animal behavior</li> <li>• Animal development and growth</li> <li>• Body systems</li> <li>• Cell structure and processes</li> <li>• Ecology</li> <li>• Evolution</li> <li>• Genetics</li> <li>• Homeostasis</li> <li>• Life cycles</li> <li>• Molecular basis of heredity</li> <li>• Origin of life</li> <li>• Photosynthesis</li> <li>• Plant development, growth, structure</li> <li>• Populations</li> <li>• Taxonomy</li> </ul>	<ul style="list-style-type: none"> <li>• Atomic structure</li> <li>• Chemical bonding, equations, nomenclature, reactions</li> <li>• Electrical circuits</li> <li>• Elements, compounds, mixtures</li> <li>• Force and motions</li> <li>• Gravitation</li> <li>• Heat and work</li> <li>• Kinetic and potential energy</li> <li>• Magnetism</li> <li>• Momentum</li> <li>• The Periodic Table</li> <li>• Properties of solutions</li> <li>• Sound and light</li> <li>• States, classes, and properties of matter</li> <li>• Waves</li> </ul>	<ul style="list-style-type: none"> <li>• Earthquakes and volcanoes</li> <li>• Earth’s atmosphere</li> <li>• Earth’s resources</li> <li>• Fossils and geological time</li> <li>• Geochemical cycles</li> <li>• Groundwater</li> <li>• Lakes, rivers, oceans</li> <li>• Mass movements</li> <li>• Plate tectonics</li> <li>• Rocks, minerals</li> <li>• Solar system</li> <li>• Stars, galaxies, and the universe</li> <li>• Water cycle</li> <li>• Weather and climate</li> <li>• Weathering and erosion</li> </ul>